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AMERICAN AND OTHER PATENTED INVENTIONS.

NOVEMBER, 1833.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Proposed methods for facilitating the Extraction of Oil from Cotton Seed.

TO THE COMMITTEE ON PUBLICATIONS.

The usefulness of oil in supplying many of the wants of society, the great demand for it, and its general consumption, have given to it an importance that has commanded the attention of the statesmen, agriculturists, and merchants, of most nations; and we perceive that all their exertions have brought into market a quantity short of the demand, and that the consumption would be greatly extended if the supply were increased.

It is one of those articles, the procuring of which from fish and from seeds, has called into action the labours of sailors and agriculturists in the United States; principally that of the former. The labour, enterprise, and capital employed in getting oil, in the South Atlantic and Pacific Oceans, are wonderful. It is somewhat surprising, that neither the profit nor the character, gained by our fishermen, has as yet excited the enterprise of any *class* of our agriculturists, farmers, gardeners, or planters, but so it is; for if we except linseed, there is little or no oil made from the agricultural products of the United States. The objects of the Franklin Institute are to develope the resources of our country; to throw all the light, possible, on the processes of industry, and to make the bringing of the products into market as simple as the nature of the case will admit; to cultivate whatever is cal-

culated to make a demand for labour, and the employment of all, according to their respective capacities and means, to the end that there should be none who shall not be in the enjoyment of the necessaries and comforts of life. I shall, in furtherance of this object, present the readers of the Journal with some new processes for extending the production of vegetable oil, and which I am convinced are feasible, and founded on correct principles, and when carefully carried into practice will be followed with success.

It is proper to mention, for the encouragement of the American agriculturist, that in France, in her southern provinces, they make large quantities of olive oil, and out of the refuse or grosser parts, a useful soap, known in commerce by the name "Castile Soap." It is an article of very extensive consumption, and a substitute for it may be found in some of the vegetable soaps that will be made here. In the north, an excellent oil for the table is made from the seed of the white poppy; this is so good, that when only five or six weeks of age from the time it has been expressed from the seed, it is difficult to distinguish it from the olive; and through most parts of France and England, very great quantities of oil are made from the seeds of colchicum, a plant known in Britain by the name of "Rape seed." This oil is used in burning, and is employed in many manufacturing processes. There is every reason to believe, that the soil and climate of the greater part of the United States, and certainly that of Kentucky, Indiana, Illinois, Tennessee, &c. would prove more congenial to colchicum than that of either England or France.

My purpose, however, is not to write a treatise on the plants that produce seed which yield oil, or on their cultivation, but to give some new processes for making oil out of the seeds when grown; and as we have cotton seed in great abundance, and but little use is made of it, I shall take it for the material to be considered in this essay.

The quantity of oil in cotton seed is considerable, but the procuring of it has hitherto been so much impeded by the fuzzy cotton which adheres to the shell, or bran, that no progress has been made in this as a branch of business. My object is to suggest means to avoid the difficulties that attend the flaxseed process of bruising and pressing, and to get as much, and purer, oil. I have heard that it has been proposed to get rid of the cotton fibres, which adhere to the seed, by burning; but am not informed how far the plan has been successful.

Two plans for making cotton seed oil present themselves, the one by mechanical means, the other by chemical process—and I shall begin with the former.

Let the cotton seed be subjected to the same process which is employed to make what in this country is called "Pearl Barley," and in England, Ireland, and Scotland, is termed "Pot Barley." The mill, or machine, that converts the grain barley into pearl barley, is very simple, and consists of a large grindstone enveloped in a case of sheet iron that is larger than the stone, by some three or four inches, at all places, and this case is perforated with many holes, made with

the point of a punch, driven from the outside, so that the inside of this case forms a species of grater. The grindstone, in the act of working, turns very fast, while the enveloping case moves slowly. The former scours off all the shell, while the motion of the latter turns over and mixes all the grains, and brings every one of them in contact with the grindstone. The process is continued until the workman judges that his grist is sufficiently skinned, when he stops his mill, draws out a slide door, and examines it, and if it has arrived at the proper state, he turns the iron case round, so as to bring the slide door down, and the contents are received into a box; the case is immediately refilled and again put in action. The grist taken out is put into the hopper of a wind fan, and all the shells and dust blown away from the kernel of the grain. which is now converted into "Pot Barley." It is proposed to treat cotton seed precisely in the same way, and when it is fanned, to bruise the seed, and then press it exactly as in the case of flax seed. This part of the business must prove even more easy and productive than with flax seed, because the cotton will be the cleaner of the two.

There are in all processes many minutiæ, great attention to which is requisite for bringing out the best results. These, the workman will discover in the course of his business. He will learn how much seed, put into the case, answers best, (for it must not be entirely full,) and the degree of heat that makes the oil press out to most advantage.

I shall now proceed to give the chemical process. The seed should be as well freed from cotton fibres and foreign matter as possible; then be thoroughly bruised and well boiled in ley, made of potash; or soda, when the object is to produce a hard soap, as potash will give only that which is soft. When oil is wanted, let the boiled mass cool to the temperature that experience shows answers best. Then pour in some sulphuric acid; this acid and potash having a strong affinity for each other, the potash will leave the oily matter it was combined with, and which it held in the state of soap,* and the union that takes place between the sulphuric acid and the potash, will leave the oil free; the liberated oil will ascend to the top, and may then be skimmed off, or some contrivance may be made for allowing it to run off, into a vessel proper for its reception. This process is practised in some branches of manufactures. In making buff leather, after the oil has produced the desired effect on the hides, it is extracted by the agency of potash, and the oil is recovered from the water, in which it exists in a soapy state, by putting sulphuric acid into the water; a union takes place between the potash and sulphuric acid, and the oil rises to the top. Sulphuric acid, since it has been made in the United States, has so fallen in price, that the objection of cost is so far removed. The high price of soda may prove to be an obstacle to making hard soap out of vegetable matter, by this process; but that obstacle will be removed when the making of soda in this

* The very respectable author of this essay seems to us to have overlooked the complex nature of the results produced by the action of alkalies upon the oils. Com. Pub.

country shall have become a business; for then, as with all other things, the price will come down.

When we consider the millions which this oil trade may be made to yield, it insures to the cotton planter the long enjoyment of his present prosperity, even after the increase of its production in this and other countries shall have brought the production of cotton up to its consumption. This must show to those interested, the vast importance of having these processes carefully put into operation, far outweighing the effect of a little more or less import duty; at one and the same time, promoting their individual wealth, comfort and tranquillity, and making the state a richer, more useful, and respectable member of a union essential to the happiness of all.

TH. PRSDNT.

Philadelphia, September 14th, 1833.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Meteorological Remarks.—Aurora.—Theory of Water Spouts. By JAMES P. ESPY.

In one of my preceding essays on meteorology I mentioned an observation made during the summer of 1831, namely, that the highest clouds moved constantly, for upwards of fifty days, from the west and south-west. This occurred every day on which these clouds were visible; on one or two days of the time there were no clouds, and on one or two others, the lower clouds could not be penetrated by the sight.

During this period the lowest current of air, and also a middle current which frequently differed from both, changed again and again to every point of the compass.

Since that period I have had much reason, from constant observation, to believe that the uppermost current of air in which clouds form, never deviates much from a south-westerly direction. Nor is it very difficult to assign a cause for this.

If we assume the mean temperature of the air at the tropic of Cancer to be eighty degrees higher than the mean temperature of the air at the Arctic Circle, which, according to the latest observations on temperature, is not far from the truth, and if we allow that the air at the tropic is expanded $\frac{1}{480}$th part, for every degree of Fahrenheit, of the volume it would occupy at the arctic temperature, (which is too small an allowance, because the arctic temperature is below thirty-two degrees,) then will the surface of the tropical atmosphere stand higher by one-sixth of the whole height than the surface of the arctic atmosphere, otherwise there would not be an equilibrium. Thus it appears that the surface of the atmosphere between the tropic of Cancer and the Arctic Circle, is an inclined plane eight miles high, with a base reaching across the temperate zone.

It is not very easy to calculate exactly the velocity which the air acquires in flowing down this plane, but it is easy to see that it must be considerable, and as it leaves the tropical regions with a velocity

of diurnal revolution greater than that of the climates over which it passes, it must deviate more and more from a direction due north, which would be its course if the earth did not revolve on its axis, and finally, in very high latitudes, it must take nearly an eastern direction. As this current is spread over the entire temperate zone, and all its parts move exactly in the same direction, it will not readily change its course from slight causes.

It might be thought, that when a great rain occurs over a particular region, for instance, over Pennsylvania, the great condensation of air which takes place over this state in consequence of the transformation of vapour into water, would cause a depression of the surface of its atmosphere, and thus cause a current of air to set in above from New York, New Jersey, Maryland, and Ohio, towards the rain. This is indeed precisely what would take place if there was a condensation of the atmosphere by a change of vapour into water. But instead of a condensation of the air being produced by rain, it is easy to show that the caloric given out in the condensation of the vapour into water is far more than sufficient to expand the air into the bulk occupied by both air and vapour previous to the rain.

Suppose, for example, one inch, in depth, of rain falls on Pennsylvania, which is equal in weight to one-four hundredth of the weight of the whole atmosphere. Now if vapour were of the same specific gravity as air, the atmosphere, if there were no counteracting cause, would be diminished in height as well as in weight one-four-hundredth of the whole. But as the specific gravity of vapour is only 623, air being 1000, the condensation caused by one perpendicular inch of rain, will be one-two-hundred and fiftieth of the whole, which is exactly one-fifth of a mile if the atmosphere is fifty miles high.

This is the amount of contraction on the supposition that there is no counteracting cause.

Now let us examine the amount of expansion caused by the caloric evolved by the vapour when it changes into rain. The capacity of the air for heat is only about one-fourth that of water, and as it is known that when vapour is turned to water it gives out caloric enough to heat the water 1000 degrees, or an equal weight of air 4000 degrees, it may be easily perceived by pursuing the calculation in this way, that one inch of rain will give out heat enough to impart ten degrees of heat to the whole atmosphere from the surface of the ground to the surface of the atmosphere, as far as the rain extends. If we suppose the mean temperature of the atmosphere at the time of the rain to be thirty-two degrees Fah. these ten degrees will expand the atmosphere one-forty-eighth of the whole—which is about one mile.

If, now, the one-fifth contraction, as explained above, be subtracted from the expansion, there will remain four-fifths of a mile, which is the real quantity of elevation caused in the atmosphere over a rain of one inch in depth.

This swelling up of the air over the region of rain will no doubt cause slight deflections in the upper current; for there will be a tendency outwards in all directions from the rain, in the whole region of the atmosphere above the cloud. Below the cloud, down to the very

surface of the earth, with the exception of the very borders of the shower, the air will move in all directions towards the rain with a velocity proportionate to the quantity of rain fallen, and the rapidity of the fall.

Nor is this mere theory; observation having verified it. One of the most remarkable examples of it, within my recollection, occurred on the 10th, 11th, 12th, 13th, 14th, and 15th, of May, 1833. During this whole time the wind was constantly south at Philadelphia, and I afterwards learned that it rained every one of those days in Canada. The same probably occurred in the northern parts of New York, as the Hudson rose to an unusual height. The rains are indeed the only cause of the irregularity of the winds at the surface of the earth. For so far as the equilibrium is disturbed by caloric, this cause is uniform, and would produce a constant flow of the air below towards the south-west, and above towards the north-east. Besides, there is sometimes a middle current moving in a direction different from the other two.

In making an observation as to the directions of these different currents, great care is necessary to avoid being deceived; for if the upper clouds should happen to move faster than the lower ones, they would be taken, unless the observation be carefully made, for the lower ones. And if the direction of one cloud is inferred from another cloud as an object of comparison, error will generally be the result. To ascertain which cloud is the highest, I let the clouds overlap repeatedly; and to ascertain their direction I keep my head steady, and refer their motion to some fixed object, as the top of a chimney, or the moon—and for such an observation I generally prefer clouds near the zenith, because their angular motion is much more rapid than that of clouds near the horizon.

When a middle current occurs I have frequently observed that it is in consequence of a change of air—the lower strata of air beginning to change first—whether this is always the case I am not prepared to say. Such a coincidence of circumstances appears to me very favourable to the production of an aurora borealis.

Suppose the air in motion for some days from the north towards the south, or any where near that direction, bringing with it a low dew point; suppose the air below suddenly to change round and blow from the south, or nearly so, towards the north, bringing with it a high dew point, whilst a middle current is still blowing from the north. When the upper current with its low dew point, overlaps the lowest current with its high dew point, the vapour in the lowest current shoots itself up, by its own elasticity, into the upper and colder current, and either by forming a better conductor than existed there before, permits the transmission of electricity from one current to the other, or else, by condensing in the colder current, gives out electricity. In the latter case clouds would certainly be formed, in the former, they might, or might not. This hypothesis requires the confirmation of repeated observations; I have seen but three auroras since I conceived the hypothesis, and all the phenomena observed in these were highly favourable to it.

It is now a point well established, that the aurora is in the region

of the clouds,* sometimes not a mile high, and on the night of the 17th May, 1833, the motion of the beautiful arch of light towards the south was exactly equal to the motion of the clouds in the same direction—all the heavens north of the arch being cloudy, and all south being clear.

This aurora moved south about seventy degrees in an hour and a quarter, forming a brilliant arch as it approached near the zenith, and disappeared about fifteen minutes after ten o'clock, about eleven degrees south of the brilliant star in Lyra.

Now if my hypothesis is correct, this arch was seen north of Philadelphia, at an earlier hour, and south of Philadelphia at a later hour. If any observer has taken a note of the time when the arch was formed and disappeared, either to the north or south of Philadelphia, I hope he will be induced, by these remarks, to send his observations for publication in the Journal. These hypothetical views, even if they should be found untenable, will not be without their use, if they induce observers to record their observations, noting the time of the appearance of particular phenomena. I am authorized by the committee of meteorology of the Franklin Institute, to say that such observations, and any others on kindred subjects, communicated for the Journal, will be particularly acceptable.

After dealing so much in hypothesis, I will now present to my readers what I hope they will allow to be the true rationale of a phenomenon which has never yet been correctly explained.

The Waterspout.

When a waterspout occurs it is acknowledged on all hands, and by every observer, that it is attended with a whirlwind. Now a whirlwind, by the centrifugal force of the air in circular motion, produces a rarefaction of the air within—sudden rarefaction is always attended with cold—and cold, if great enough, produces condensation of vapour—and sudden condensation of vapour in the air, is followed by rain.

If a waterspout is always rain, the explanation is already given. The water which accompanies the phenomenon is not taken up from the sea, as Dr. Franklin supposed; for it has never been discovered to be salt, and it also sometimes appears on land, therefore it undoubtedly comes downwards. The waterspout appears more frequently in the torrid zone, where the dew point is always very near the temperature of the air. Now it is known by experiment that a very slight rarefaction of the air will produce such a diminution of temperature as to cause a great condensation of vapour, when the dew point is near the temperature of the air.

As to the great quantity of vapour condensed into water during the progress of this phenomenon, more perhaps than is contained in the whole space occupied by the waterspout and whirlwind, it may be ac-

* We do not consider with our friend that this point has been satisfactorily determined—see the report on meteorology to the British Association for the Advancement of Science, by Professor Forbes, of Edinburgh.

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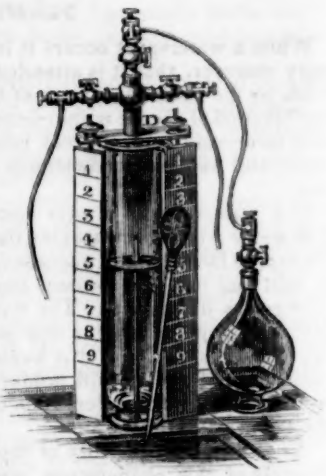
counted for by this consideration—that as soon as the vapour begins to condense by the rarefaction and refrigeration of the air, the rarefaction of the vapour is greater than the rarefaction of the air caused by centrifugal force alone; and therefore the vapouric atmosphere will press itself through the whirlwind into the greater vacuum of vapour, and thus the supply will be constantly kept up. Besides, during the progress of the whirlwind, new portions of air, with its vapour, are constantly brought within its action.

I may mention here, for the sake of some who may read these remarks, and have not attended to the subject before, that it is now known to meteorologists, that aqueous vapour and air form independent atmospheres, each pressing only on particles of its own kind, and that the vapour which is in the atmosphere is not in the least degree buoyed up by the air, but supports itself by its own elasticity, becoming more rare, like the air, as the elevation increases.

Large Volumescope, for the Analysis of Atmospheric Air, by means of Nitric Oxide. By ROBERT HARE, M. D., *Professor of Chemistry in the University of Pennsylvania.*

This apparatus illustrates conspicuously the condensation which ensues when nitric oxide gas and atmospheric air, are mingled in due proportion.



The hollow glass cylinder, which constitutes the main body of the instrument, is four and a half inches in diameter, and thirty in height. It is situated over one of the three wells in my pneumatic cistern; being secured between two iron rods well fastened to the shelf below; and terminating above in screws furnished with nuts. By means of these screws, and an intervening bar of iron, a brass disk, by which the upper orifice of the cylinder is closed, is pressed upon the rim of that orifice, so as to make with it an air tight juncture. From a hole in the centre of the brass disk, a stout tube of brass proceeds, terminating in three cocks, furnished with gallows screws, so as to permit of the attachment of three flexible leaden tubes. Of these, one communicates with an air pump, another is attached to a pear shaped glass receiver, which (for want of a better name) I shall call a volumeter, as it serves

conveniently, and accurately, to measure gas into precisely equal volumes.

On each side of the cylinder, a strip of wood covered with white paper, is supported; each of which is made to receive graduating lines in the following way. The cylinder having been filled with water, the lines are so applied as to indicate the changes of level successively produced in the surface of the water within the cylinder, by the successive introduction of equal volumes of air. These graduations are so proportioned, as to render the portion of the cavity comprised within three of them equivalent in content, to one measure of the volumeter already described. In all there are nine graduations.

In operating with this instrument, I commence by exhausting the air from the cylinder, and thus causing the water of the pneumatic cistern, over which it is situated, to rise to the fifth graduation. The volumeter may be filled at the same time, if the cocks between it and the cylinder be opened. Care must be taken to close them as soon as the water reaches the apex, so as to prevent the lead tube from being obstructed by water. The volumeter should, in the next place, be filled with nitric oxide gas. The apparatus thus prepared, it is only necessary to open the cocks, between the volumeter and the cylinder, in order to cause the nitric oxide to pass from the one to the other. Copious red fumes of nitrous acid immediately appear. By means of the gum elastic bag, and recurved tube, jets of water are next to be thrown up into the mixture, by which the absorption of the fumes is promoted. When these have all been absorbed, there will appear to have been a condensation of about three volumes and a fifth, so that the water will have risen a little above the point to which it has been supposed to be raised agreeably to the premises.

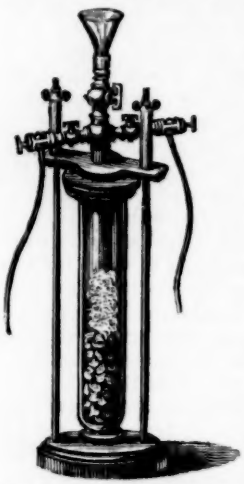
For the satisfaction of spectators, the accuracy of the graduation may be proved by allowing the contents of the volumeter in atmospheric air to pass in three times, showing that the water is thereby depressed to 3d, 6th, and 9th graduations. Also, by adding the contents of the volumeter containing three of the volumes indicated by the scale, to five previously introduced; thus, showing that the aggregate will be eight volumes, instead of less than five, as when three of nitric oxide are admitted to five of air.

Apparatus for showing the influence of Pressure on Effervescence.

By the Author of the preceding article.

A tall cylindrical receiver is supported on a wooden pedestal, between upright iron rods fastened into the pedestal, and at top cut into screws furnished with nuts. By means of these screws and nuts, and an intervening cross bar, a disk of lead, alloyed with tin to harden it, is pressed upon the rim of the receiver. The disk is so fitted to the rim of the glass, as that, with the aid of sheet gum elastic, or oiled

leather, an air tight juncture may be made. In the middle of the disk there is an aperture, from which proceeds a stout tube, with a cock on each side, severally furnished with gallows screws, by means of which, lead pipes may be made to communicate with an air pump on one side, and a condenser on the other. The tube is also surmounted by a cock into which a glass funnel has been cemented. Before closing the receiver with the disk, some carbonate of lime, or carbonate of ammonia must be introduced, so as to rise to about half the height of the receiver. I have found calcarious stalactites, like those from Weyer's cave, to be excellent for this purpose. The carbonate being introduced, and the disk fastened into its place, as represented in the figure, diluted muriatic acid may be added, by means of the funnel and cock, in quantity sufficient to cover the carbonate. Of course effervescence immediately ensues. If, under these circumstances, by means of the air pump, the atmospheric pressure within the receiver be lessened, the effervescence increases strikingly. On the other hand, if by closing the communication with the air pump, and opening that with the condenser, while this is in operation, the pressure be increased, it will be seen that the effervescence is diminished proportionably.



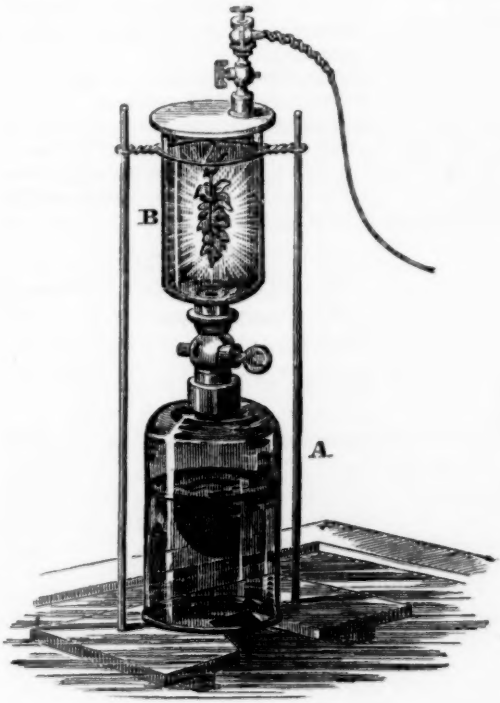
Engraving and description of an apparatus for exhibiting the combustion of Leaf Metal in Chlorine.

By the Author of the preceding article.

The spontaneous combustion of metallic leaves in chlorine, is but imperfectly seen when, by means of a rod, we introduce them into a vessel with a narrow mouth, replete with that gas. In passing into the vessel, the leaf carries with it atmospheric air, and first encounters the chlorine in a state of dilution. Hence a languid reaction ensues, and fumes are produced which obscure the ignition when the residual portion of the metal reaches that part of the cavity in which the chlorine is sufficiently pure to ignite them vividly. I have contrived two modes of exhibiting this combustion in all its beauty. According to one, the open necks of two bell glasses, A and B, were united, and made to communicate with each other by means of a cock. Of these, one was placed over a pneumatic cistern, and filled in the usual manner with chlorine; the other bell was, of course, in an in-

verted position, so that it might be closed by a plate of brass ground to fit upon it air tight. In this plate there is a cock communicating with a pipe, which is to be attached to an air pump when necessary. From the centre of the brass plate within the upper bell glass, B, leaves of dutch gold were suspended. By means of an air pump, this bell being exhausted, on turning the cock, by which the communication between the bells was regulated, the chlorine was instantly transferred from the lower to the upper bell, so as to surround the leaves and produce with them a most vivid combustion.

Of this apparatus, an engraving and description was published in Silliman's Journal, some years since, but as it has never appeared in the Journal of the Franklin Institute, I subjoin the figure of it here



The other mode of operating is illustrated by tne following figure, which, it will be observed, differs but little from that described in the preceding article, for showing the influence of pressure on efferves-cence.

The funnel being removed, into the lower orifice of the cock, which supported it, a rod is screwed fast. This rod is of such dimensions, as to extend from the top to the bottom of the receiver, and is supported within it, so as to be in its axis, or every where equidistant from the surface.

Before fastening the plate into the situation in which it is represented in the figure, it must be lifted in order to attach the leaf metal to the rod, with the aid of gum arabic. By means of one of the flexible pipes and cocks with which the apparatus is furnished, communication may be made with an air pump, and in like manner with a large vessel containing chlorine, by means of the other pipe and cock.

The preliminary arrangements being so far completed, the cylindrical receiver having been exhausted by means of the air pump, the cock regulating the communication with that instrument, is to be closed; and the other, which controls the entrance of the gas, is to be opened. By these means, the leaves burn splendidly, being simultaneously enveloped in an atmosphere of the chlorine, which rushes in to supply the vacuum caused by the air pump.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Attempt to fix the date of Dr. Franklin's observation, in relation to the North-east Storms of the Atlantic States. *By* A. D. Bache, *Prof. of Natural Philosophy and Chemistry in the University of Pennsylvania.*

[Substance of a verbal communication made to the Am. Philos. Soc.]

A map of Pennsylvania, New Jersey,* &c., published by Lewis Evans, which was at a late meeting deposited with the Philosophical Society, contained a memorandum to this effect; "All our great storms begin to leeward: thus a NE. storm shall be a day sooner in Virginia than Boston." As this map bears date 1749, it became a question whether the observation just recorded was prior or subsequent to the corresponding observation of Dr. Franklin, that the north-easterly storms of the Atlantic States begin to the south-west. The result of an attempt to fix the date of Dr. Franklin's observation, and which shows that it was made six years before the publication of the map by Lewis Evans, cannot be without interest to a society over which Franklin once presided.

The observation of Dr. Franklin is given in a letter to Mr. Alexander Small, dated London, May 12th, 1760. This letter seems to

* Entitled "A Map of Pennsilvania, New Jersey, New York, and the three Delaware Counties, by Lewis Evans, MDCCXLIX."

have been written in reply to some remarks in which the gentleman to whom it is addressed had shown a want of acquaintance with, or some doubts of, the fact, or to some inquiries in relation to the time at which the fact had first been noticed. Dr. Franklin was, at the date of this letter, a resident in London, as agent for the colony of Pennsylvania. The letter is as follows:

"Agreeable to your request, I send you my reasons for thinking that our north-east storms in North America, begin first, in point of time, in the south-west parts: that is to say, the air in Georgia, the farthest of our colonies to the south-west, begins to move south-westerly before the air of Carolina, which is the next colony north-eastward; the air of Carolina has the same motion before the air of Virginia, which lies still more north-eastward; and so on north-easterly through Pennsylvania, New York, New England, &c. quite to Newfoundland."

"These north-east storms are generally very violent, continue sometimes two or three days, and often do considerable damage in the harbours along the coast. They are attended with thick clouds and rain."

"What first gave me this idea was the following circumstance. About twenty years ago, a few more or less, I cannot from my memory be certain, we were to have an eclipse of the moon at Philadelphia, on a Friday evening, about nine o'clock. I intended to observe it, but was prevented by a north-east storm, which came on about seven, with thick clouds as usual, that quite obscured the whole hemisphere. Yet when the post brought us the Boston newspaper, giving an account of the effect of the same storm in those parts, I found the beginning of the eclipse had been well observed there, though Boston lies north-east of Philadelphia about 400 miles. This puzzled me, because the storm began with us so soon as to prevent any observation, and being a north-east storm, I imagined it must have begun rather sooner in places farther to the north-east than it did at Philadelphia. I therefore mentioned it in a letter to my brother who lived at Boston, and he informed me the storm did not begin with them till near eleven o'clock, so that they had a good observation of the eclipse: and when comparing all other accounts I received from the several colonies, of the time of beginning of the same storm, and since that of other storms of the same kind, I found the beginning to be always later the farther north-eastward. I have not my notes with me here in England, and cannot, from memory, say the proportion of time to distance, but I think it is about an hour to every hundred miles."

A tenacious memory for facts enabled Dr. Franklin thus to state the circumstances which had led to his observation, although the date of the year when it was made had escaped his recollection. Of the points to which he refers for fixing the date of his observation, the first seems least to be relied on, namely, that it was about twenty years before the date of his letter, that is, about the year 1740, this being the one in relation to which he expresses no confidence. The others are precise; there was to have been an eclipse of the moon on

a Friday evening about nine o'clock: the disappointment of not being able to observe this on account of the coming up of clouds, had strongly impressed upon his mind the date of the beginning of the north-easterly storm at Philadelphia. In ascertaining the date, the first to these points should, in accordance with the remarks just made, be examined with a considerable allowance for vagueness, and the second be mainly depended upon. I have, by referring to sources which are sufficiently exact, namely, the printed calendars of that day,* ascertained the times of the occurrence of lunar eclipses, visible in Philadelphia and Boston, between the years 1734 and 1748, a range of fourteen years, of which six are prior to 1740, the twentieth year before the date of Dr. Franklin's letter, and eight are subsequent to that year; the reason for extending the period, subsequent to that year, will appear from the conclusions drawn from the table.

I have preferred a reference to these calendars comprising the calculations of many persons, rather than to adopt the result of a table of eclipses such as that contained in Ferguson's Astronomy,† where the calculations of but a single individual are recorded.

Year. (Old style.)	Month.	Day of the month.	Day of the week.	Time of day.	No. of digits eclipsed.	Remarks.
1734				H. M.		None.
1735	September	20	Saturday	8 — P.M.	7	
1736	March	15	Monday	7 — ,,	12	Rises eclipsed.
,,	September	8	Wednesday	8 18 ,,	,,	
1737	August	28	Sunday	9 40 ,,	$5\frac{1}{4}$	
1738						None.
1739	January	13	Saturday	4 30 ,,	$6\frac{1}{2}$	
1740	January	2	Wednesday	3 39 ,,	—	
,,	June	28	Saturday	2 35 ,,	12	
,,	December	21	Sunday	5 18 ,,	5.7	
1741						None.
1742	November	1	Tuesday			Before sunrise.
1743	October	21	*Friday*	8 30 ,,	12	
1744	October	10	Wednesday			Near sunrise.
1745						None.
1746	August	19	Tuesday	5 35 ,,		Rises eclipsed.
1747	February	13	*Friday*	10 27 ,,	12	
,,	August	9	Sunday	1 51 A.M.	12	
1748	February	3	Wednesday	5 46 ,,	3.2	
,,	July	28	Thursday	6 56 ,,	5.3	Rises eclipsed.

* A valuable collection of English Almanacs, which belonged to Dr. Franklin, is now in the possession of the Am. Philos. Society, of Philadelphia.

† This particular table contains only a list of those eclipses which were visible in Europe.

There are but two eclipses within the range of this table which occurred on Friday, the first in 1743, and the second in 1747; the first was seventeen years before the date of the letter of Dr. Franklin, the second but thirteen. To suppose that the observation was made on the occurrence of the former, is to allow a latitude of but three years in construing the expression "about twenty years ago:" thirteen years could not so well have been mistaken for twenty. Again, the eclipse of 1743 occurred at half past eight in the evening, or, "about nine o'clock," while that of 1747* was at half past ten at night. These circumstances would determine us to adopt the former of these dates, as that of the occurrence which led to the observation under discussion. A reference to the journals of those two years, lends additional strength to this conclusion. In the Pennsylvania Gazette, I find in November, 1743, a notice of a violent storm at Boston, on Saturday, October 22nd, and an account of the disasters caused by it in the harbour of that city, as well as along the coast further north. The following extract will be sufficient to show the nature of the remarks:

"Boston, Oct. 24th. Last Saturday we had a violent NE. storm, that brought in an exceedingly high tide," &c. &c.

"Boston, Oct. 31. We learn from Piscataqua that the late eastern storm on the 22nd inst. was as violent, and the tide as high, as in these parts."

On examining a file of the paper published in Philadelphia by Andrew Bradford, in 1747, I find no account of a north-easterly storm on the coast, on, or about, the 13th of February, although mention is made that a vessel which left Boston some time in February, encountered a storm after having been several days out at sea, and particular reference is made to certain naval operations, connected with the Spanish war, on the coast.

From a review of these circumstances, I conclude, that the observation of Franklin was suggested by, and made immediately subsequent to, the lunar eclipse of October 21st, 1743.

FRANKLIN INSTITUTE.

Monthly Conversation Meeting.

Prof. Hare showed the operation of a new double acting air pump of his invention, at once characterized by efficiency and simplicity. The pump, though double acting, has but a single barrel, the valves are opened and closed at proper times, by mechanical means, and the conversion from an exhausting into a condensing pump is effected by simply changing the connexion of the attached vessel; in fact, the pump may be made to exhaust air from one vessel, and condense it in another, at the same time. By means of this pump, air or other gases may be transferred directly from one vessel to another, being drawn from the first and forced into the second. Prof. Hare also showed an instrument for the transfer of corrosive liquids, which is figured and described in the Journal of the Franklin Institute for October.

* The years 1747 and 1748 were remarkable in Franklin's life, as he was then actively engaged in his first electrical researches.

The percussion lock of Messrs. Keith and Butterfield was exhibited by the inventor in a room adjoining the reading room, and there tried. The conditions to be fulfilled by a cannon lock, effecting the discharge by percussion powder, were discussed by the members.

Specimens of tinned cast iron, from the manufactory of Mr. Babbett, in Taunton, Mass., were placed upon the table; this new article was a desideratum; the tinned surface appeared perfect, no projecting points of iron being visible.

Two twelve inch globes, by Mr. Josiah Loring, of Boston, were submitted for examination.

Mr. Thomas Fletcher explained the operation of an instrument called a chronograph, for noting the time of any observation: the maker's name is Fatton, a pupil of the celebrated Breguet, of Paris. A pen of peculiar construction, and moved by a spring, leaves a dot of ink upon a revolving dial plate, marking the time at which the spring was touched.

Specimens of Berlin cast iron were placed upon the table by Mr. Fletcher.

A new edge-rail by Gen. W. B. Mitchell, was explained by Col. S. H. Long; the specimen rail was of cast iron, but in use it is to be of rolled iron; one of the points of recommendation was the ease with which the proposed form may be given by the roller.

Specimens of medal ruling on gold and silver, by Asa Spencer of this city, were submitted by Prof. A. D. Bache, who briefly adverted to Mr. Spencer's method of accomplishing the results under examination.

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*Appendix to the Report of the Committee of the Franklin Institute on Weights and Measures.**

Letter from the Secretary of the Commonwealth of Pennsylvania to the Managers of the Franklin Institute.

SECRETARY'S OFFICE, HARRISBURG, May 29, 1833.

GENTLEMEN:—I have the honour to send you herewith a copy of a resolution of the House of Representatives of this Commonwealth, passed the 5th ult. accompanied by a printed copy of the bill therein referred to, (as I find it upon the files of the House,) with a request that you will take the same into consideration, and report thereon, to this department, previously to the meeting of the next Legislature.

This transmission has been delayed until now by reason of my unavoidable absence from the seat of government. It is hoped, however, that sufficient time remains for the full consideration of the bill, in accordance with the views of the House, as expressed in the resolution.

I am, very respectfully, your obt. servt.

S. M'KEAN.

To the Managers of the Franklin Institute
of the State of Penn. Philadelphia.

* We have deemed it adviseable to present to our readers these documents, which are necessary to a full comprehension of the report to which they are appended. COM. PUB.

Resolution accompanying the Letter of the Secretary of the Commonwealth.

IN THE HOUSE OF REPRESENTATIVES, April 5th, 1833.

Resolved, That the Secretary of the Commonwealth be, and he is, hereby directed to refer bill No. 197, on the files of the House of Representatives, entitled "An act relating to weights and measures and to admeasurement," to the Managers of the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, with a request that they would take the same into consideration, and report to the said Secretary, previous to the meeting of the next Legislature.

Extract from the Journal.

FRS. R. SHUNK. Clerk.

A Bill relating to Weights and Measures, and to Admeasurement. Reported to the House of Representatives of Pennsylvania. January 26, 1833.

TABLE OF CONTENTS.

SECTION 1. Governor to procure state standards for weights and measures.
2. Standards to be verified from time to time, &c.
3. " made to conform to United States standards when established.
4 Standard yard to be the unit of length, one-third of the yard to be a foot, one-twelfth of such foot to be an inch.
5. " to be graduated so as to exhibit all customary divisions.
6. Multiples and fractions of the yard, foot, or inch, to be in parts of the standard.
7. Wine gallon to contain two hundred and thirty-one cubical inches, beer gallon to contain two hundred and eighty-two cubical inches.
8. Bushel to contain two thousand one hundred and fifty and forty-two hundredths cubical inches.
9. Measures of the aliquot parts of wine gallon, beer gallon, and bushel, to be proportionate.
10. Lime bushel, form of.
11. Weights, pound troy, pound avoirdupois.
12. " of aliquot parts of the pound, &c. to be proportionate.
13. Governor to procure standards of weights, &c. for the respective counties, and cause them to be delivered to the commissioners.
14. Standards of the counties to be verified once in ten years.
15. Commissioners of the counties to appoint inspectors and regulators.
16. Inspectors to make oath, &c. of office.
17. Compensation for regulating weights, &c.
18. Weights, &c. when regulated to be stamped.
19. Penalty for injuries done to weights, &c. by inspectors, &c.
20. Gauging instruments to correspond to the standards of this state.
21. Weights, &c. sold, deemed to be warranted, &c.
22. Penalty for selling by weights, &c. not duly regulated.
23. Persons selling by false weights, &c. with intent to defraud, indictable.
24. Acre of land to contain four thousand eight hundred and forty horizontal square yards. Proviso.
25. Cord of wood to contain one hundred and twenty-eight feet in solid measure.

26. A hogshead of cider to be one hundred and ten gallons, in wine measure.
27. Grain may be sold by weight. Proviso.
28. Foreign salt may be sold by weight. Proviso.
29. Anthracite coal may be sold by weight or measure.

AN ACT RELATING TO WEIGHTS AND MEASURES AND TO ADMEASUREMENT.

SECTION 1. Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same, That it shall be the duty of the governor to procure for the use of the commonwealth, metallic standards for weights and measures, according to the denominations of weights and measures which have been used and approved in this commonwealth, which standards shall be enclosed in suitable cases, and deposited and carefully preserved in the office of the state treasurer.

SECTION 2. And be it further enacted by the authority aforesaid, That it shall also be the duty of the governor, from time to time, as he shall judge expedient, to cause the said standards to be examined and tried, and if necessary, to be corrected or renewed, so that they shall at all times be of their original measure or weight and proportions.

SECTION 3. And be it further enacted by the authority aforesaid, That, *Provided nevertheless*, That, if the Congress of the United States shall hereafter establish a standard for any of the denominations of weights or measures, it shall be the duty of the governor to cause the standard of this commonwealth, for the same denomination, to be made equal in all respects, and to be at all times conformable thereto.

SECTION 4. And be it further enacted by the authority aforesaid, That the standard yard which shall be procured by the governor, shall be taken as the unit of all measures of length, and one-third part of the said standard yard shall be a foot, and one-twelfth part of such foot shall be an inch.

SECTION 5. And be it further enacted by the authority aforesaid, That the yard aforesaid shall be graduated or divided by marks engraved thereon, so that it shall exhibit distinctly the following measures, to wit:

The length or rectilinear extension of the foot, and of the inch aforesaid, and all the customary divisions or aliquot parts of a foot.

Also, the length or rectilinear extension of one-half of a yard, one-quarter of a yard, one-eighth of a yard, one-sixteenth of a yard, and of all other customary divisions or aliquot parts of a yard.

SECTION 6. And be it further enacted by the authority aforesaid, That all measures of extension, whether binary, ternary, decimal, duodecimal, or other aliquot parts, divisions, or fractions of a yard, foot, or inch, or any multiple, or combination thereof, expressed or known, by any customary measure, or by any of the terms of admeasurement, of extension, quantity, capacity, or other dimension, shall respectively be equal to the same part, proportion, or multiple of the standard yard, foot, or inch aforesaid, and not otherwise.

SECTION 7. And be it further enacted by the authority aforesaid, That the standard measure of the wine gallon shall contain two hundred and thirty-one cubical inches of the standard inch aforesaid, and no more. And the standard measure of the beer gallon shall contain two hundred and eighty-two cubical inches, as aforesaid, and no more.

SECTION 8. And be it further enacted by the authority aforesaid, That the standard measure of the bushel shall contain two thousand one hundred and fifty cubical inches and forty-two hundredths of a cubical inch, of the standard inch aforesaid, and no more.

SECTION 9. And be it further enacted by the authority aforesaid, That the measure of any aliquot or fractional part of the wine gallon, beer gallon, and bushel aforesaid, shall be proportionate thereto respectively, in the ratio of such aliquot or fractional part.

SECTION 10. And be it further enacted by the authority aforesaid, That the bushel to be used for measuring lime, shall be made in the form, and of the dimensions following, to wit: thirteen inches and a half diameter at the bottom

in the clear, fifteen inches diameter at the top in the clear, and thirteen inches and forty-seven hundredths of an inch perpendicular depth in the clear.

SECTION 11. And be it further enacted by the authority aforesaid, That the denomination of weights shall be computed upon the troy pound of the mint of the United States, in the manner following, to wit: The troy pound of this commonwealth shall be equal to the troy pound of the mint aforesaid; the pound avoirdupois of this commonwealth shall be greater than the troy pound aforesaid, in the proportion of seven thousand to five thousand seven hundred and sixty.

SECTION 12. And be it further enacted by the authority aforesaid, That the weight of any aliquot or fractional part of the troy pound and avoirdupois pound aforesaid, shall be proportionate thereto respectively, in the ratio of such aliquot or fractional part.

SECTION 13. And be it further enacted by the authority aforesaid, That it shall also be the duty of the governor to procure to be made for each of the counties of this commonwealth, at the charge of the counties respectively, a set of standards for weights and measures, according to the several denominations hitherto adopted into use in this commonwealth, which standards shall be accurately adjusted to the standards aforesaid. And thereupon he shall cause the same to be properly sealed or stamped, and to be delivered to the commissioners of the counties respectively, to be used as standards for the adjusting of weights and measures, and for no other purpose.

SECTION 14. And be it further enacted by the authority aforesaid, That it shall be the duty of the commissioners of the respective counties, at least once in every ten years, and oftener if they have reason to believe it necessary, to cause the standards of the respective county to be examined and tried, and if necessary, to be corrected or renewed according to the standards aforesaid, of the commonwealth, so that they shall be equal, and in all respects conform and correspond thereto.

SECTION 15. And be it further enacted by the authority aforesaid, That the duty of the inspector and regulator of weights and measures, shall in the several counties of this commonwealth (except in the city and county of Philadelphia) be performed by such competent person or persons as the commissioners of the respective county shall, with the approbation of the court of quarter sessions of such county, designate.

SECTION 16. And be it further enacted by the authority aforesaid, That every person charged with the inspection and regulation of weights and measures as aforesaid, shall, before he enters upon the duties of his office, make oath or affirmation to perform the same with fidelity.

SECTION 17. And be it further enacted by the authority aforesaid, That the persons who may be charged with the inspection and regulation of weights or measures, as aforesaid, shall not be entitled to demand or receive any fee whatsoever, for their services in that behalf; but they shall be paid for the same out of the county stocks according to contract with the commissioners of the respective county; they shall demand and receive for the use of the county for every weight and measure regulated by them, such sum as the mechanical labour employed in the regulation and sealing thereof shall be reasonably worth, and no more.

SECTION 18. And be it further enacted by the authority aforesaid, That all weights and measures, and all beams, scales, and steelyards, which shall be adjusted to the standards of the respective counties as aforesaid, by the officer charged with the duty of the inspection and regulation thereof, shall be authenticated or stamped by him with some sufficient brand or seal.

SECTION 19. And be it further enacted by the authority aforesaid, That if any person charged with the duty of the inspection and regulation of weights and measures, shall unnecessarily, carelessly, or through want of skill, mar or injure any scale, beam, steelyard, weight or measure, while in his hands or possession, for the purposes of his office, the same being just and true, or susceptible of easy adjustment to the proper standard, he shall furnish forthwith

to the owner thereof a correct scale, beam, steelyard, weight or measure, of the same kind, and of equal value, or in default thereof shall pay to such owner twice its value.

Section 20. And be it further enacted by the authority aforesaid, That all gauging instruments used within this commonwealth shall be constructed so as to show the contents or ullage of any vessel or cask, according to the measures aforesaid. And if any person shall use any such instruments of any other construction or proportion, such person shall, before marking the contents of any cask, or the ullage thereof, as shown by such instrument, reduce the same to the standard measures aforesaid, under penalty of ten dollars for every neglect, for the use of any person who may be aggrieved thereby.

Section 21. And be it further enacted by the authority aforesaid, That all weights and measures sold within this commonwealth, shall be deemed to have been warranted by the seller to correspond (according to the respective denomination) with the standards aforesaid.

Section 22. And be it further enacted by the authority aforesaid, That every person who shall sell or buy any article of merchandise, or traffic, or any thing whatsoever by any false yard, beam, scale, weight or measure, to the injury of another, the person selling or buying as aforesaid, being the owner of such yard, beam, scale, weight or measure, and not having had the same duly regulated and approved by a lawful standard within one year, shall forfeit thrice the value of the article so sold or bought, one half to the use of the county, and the other half to the use of the person aggrieved, to be recovered in one action, founded on this act: *Provided*, That in no case shall the penalty aforesaid, be less than three dollars.

Section 23. And be it further enacted by the authority aforesaid, That if any person shall sell or buy any article of merchandise or traffic, or any thing whatsoever, by any false yard, beam, scale, weight or measure, knowing the same to be false, and intending thereby to deceive or defraud, such person shall be liable to indictment and punishment as in cases of misdemeanor.

Section 24. And be it further enacted by the authority aforesaid, That an acre of land shall contain four thousand eight hundred and forty horizontal square yards of the standard yard aforesaid, or a surface which shall be equivalent thereto. *Provided*, That nothing in this section shall be deemed or taken to affect the allowance of any surplus quantity to which any person may be otherwise entitled by virtue of any record, patent, deed, or other instrument, or contract.

Section 25. And be it further enacted by the authority aforesaid, That the standard dimensions of a cord of bark, or of wood for fuel, shall be eight feet in length, including one half of the kerf, four feet in breadth, and four feet in height, containing one hundred and twenty-eight feet of the standard foot aforesaid, in solid measure, well stowed and packed. And if any part of the wood be crooked it shall be placed at the top of the cord or load, and a reasonable and fair allowance shall be made by all corders and venders of wood for the deficiency which may be occasioned by such crooked or uneven wood.

Section 26. And be it further enacted by the authority aforesaid, That a hogshead of cider shall be deemed and taken to be one hundred and ten gallons thereof, in wine measure, in all cases where there shall be no special agreement to the contrary.

Section 27. And be it further enacted by the authority aforesaid, That the several kinds of grain hereinafter mentioned, may be estimated and sold by weight avoirdupois, as follows, to wit: sixty pounds of wheat, fifty-eight pounds of rye, fifty-eight pounds of corn, forty-eight pounds of buckwheat, forty-seven pounds of barley, thirty-two pounds of oats, shall be deemed and taken to be equal each to a bushel as aforesaid, of the said kinds of grain respectively: *Provided nevertheless*, That the said kinds of grain may be bought or sold by measure as heretofore.

Section 28. And be it further enacted by the authority aforesaid, That the several kinds of foreign salt hereinafter mentioned, may be estimated and sold

by weight avoirdupois as follows, to wit: Eighty-five pounds of coarse salt, seventy pounds of ground salt, sixty-two pounds of fine salt, shall be deemed and taken to be equal each to a bushel, as aforesaid, of the said kinds of salt respectively: *Provided*, That the said kinds of salt may be bought or sold by measure as heretofore.

Section 29. And be it further enacted by the authority aforesaid, That anthracite coal may be sold by weight avoirdupois, or by the bushel measure as follows, to wit: Every bushel of coal shall contain eighty pounds thereof, every hundred weight shall be deemed and taken to be one hundred and twelve pounds thereof, twenty-eight bushels or two thousand two hundred and forty pounds thereof shall be deemed and taken for one ton.

Section 30. And be it further enacted by the authority aforesaid, That all pecuniary penalties and forfeitures imposed by this act, shall be recoverable in like manner as debts of equal amount may be recovered.

Section 31. And be it further enacted by the authority aforesaid, That, *Provided* that nothing in this act shall be construed so as to interfere with any special provision heretofore made by law, respecting the powers, duties, or emoluments of the regulator of weights and measures, or of the sealer of dry measures for the city and county of Philadelphia.

Appointment of the Committee on Weights and Measures.

At a stated meeting of the Board of Managers of the Franklin Institute, held June 13, 1833, the Chairman read the above communication from the Secretary of the Commonwealth of Pennsylvania; when, on motion, the communication, together with the accompanying documents, were referred to the annexed special committee, with instructions to report to the Board.

Committee—A. D. Bache, S. V. Merrick, W. H. Keating, R. Tyler, M. W. Baldwin, B. Say, A. Spencer, A. Miller, R. M. Patterson, M. D., S. C. Walker, B. Stancliff, T. McEuen, M. D., E. Draper, D. H. Mason, B. Reeves, T. P. Jones, M. D., F. Fraley, S. Moore, and Samuel Hains.

[to be continued.]

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN MAY, 1833.

With Remarks and Exemplifications, by the Editor.

1. For an improvement in *Trusses for Hernia;* Ralph Glover, city of New York, May 3.

The truss here described differs only in some minute points from many now in use. It is said by the patentee to be an improvement upon that of Messrs. Marsh, of Montgomery county, New York; this latter truss having a steel spring which passes but little more than half way round the body, whilst that in the one now described passes much further; it has, moreover, an oval pad at the back, instead of a round one. The rupture pad, also, it is said, stands obliquely upon the spring, and the manner of attaching it to the spring is not exactly the same with that adopted in some others. This comprises the information given in the specification.

2. For a *Horse Power;* Henry Buell, Randolph, Tipton county, Tennessee, May 3.

The machine here patented is called, by the inventor, in his petition, "an improvement in concentric machinery;" and in the specification we are told that it operates by "forming a central motion." However concentric the machine may be, the description of it appears, from its obscurity, not to be the product of a concentrated mental apparatus. Although we have called it a horse power, from its being so named on the drawing in the patent office, there is not one word said about a horse or any other animal, in the description of it; but we are told that "the power required to propel this machinery is applied to the arms of the centre shaft;" how this is done we will attempt to describe in a general way, so far as we understand the same. There is to be a vertical shaft, from which a horizontal shaft extends; on the outer end of the latter, there is a wheel which supports it, its periphery resting on the ground. As this wheel rolls round, the shaft revolves with it, and generates the motion, which is to be communicated to whatever is to be acted upon by it. At the end of the horizontal, close to the vertical, shaft, there is fastened a cog wheel, which has teeth upon its face towards the shaft, and is therefore a crown wheel: these teeth take into a pinion on the vertical shaft, to which it gives motion by the rolling of the horizontal shaft. The vertical shaft upon which the pinion is placed, is a spindle which passes up through an exterior tubular, vertical shaft, and has a pulley on its top to receive a strap or band.

The horse, or "power," is applied to a frame which surrounds the horizontal shaft, and allows it to revolve within it. This arrangement, we are told, "combines an amazing leverage, power, and velocity, together, through the centre;" and the claim is to "the centre shaft, the hollow gudgeon, and the mode of applying the power and velocity of machinery from the extremity to the centre, through the hollow gudgeon." This latter is not, we apprehend, the only hollow thing about the contrivance of this concentric machine, as it is more complex than most other horse mills, without having any solid advantage to counterbalance this complexity. The rolling wheel, on the horizontal shaft, by which the power is to be communicated, must be heavily loaded, or the friction upon its tread will be less than the resistance from the labour to be performed, and it will consequently slide round.

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3. For a *Machine for cutting Crackers;* George M. Kendall, Katskill, Greene county, New York, May 3.

The dough from which the crackers are to be made is placed upon a sliding table, that is moved forward by turning a crank, which crank also carries a roller above the board, so set as to reduce or roll the dough to its proper thickness. As the dough escapes from the roller, it passes immediately under a row of cutters extending across the board, and sliding up and down in a suitable frame. The cutters are connected together, are brought down by a lever, and are

raised again by spiral springs which surround their shafts. Dockers are placed within the cutters, and also pistons which force the crackers out as the cutters are raised. The lever is made to descend by placing the foot in a stirrup suspended from it. The claim is to "the application of the spiral springs, the lever, and stirrup operated upon in the manner above described."

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4. For a rule to be used in *Cutting Garments;* James G. Wilson, city of New York, May 3.

This is a rule, with various scales, designed for the same purpose as that described at p. 249 of the last number. The patentee says, "I do not claim the divisions of the measure, nor the invention of a plain ruler, nor the materials of which it is made; but I do claim the particular mode of the construction and improvements, and the uses to which these improvements may be applied." He should have told us distinctly what constitutes the special novelty in the construction, and the precise improvements in his rule, but he has not thought proper so to do.

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5. For a *Machine for Sawing Shingles;* Benjamin and Philo Bucknell, the former of Hunter, the latter of Lexington, Greene county, New York, May 4.

This machine is intended for sawing shingles by means of a circular saw, in a way which has been extensively practiced. The arrangement of the parts for holding the block from which the shingles are to be sawed, and of the carriage, racks, &c. which shift and advance the block, is considered as new; and a machine made upon the plan of the patentees is, they say, more simple, cheap, and durable, than any other. For one very similar to this, we refer to p. 34 of the present volume.

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6. For a *Combined Furnace Steam Boiler.* First patented February 18th, 1831, by Levi Disbrow, city of New York. Patent surrendered and reissued May 6.

At p. 387 of vol. vii. we have published the specification of the patent first issued, together with a drawing showing the general construction of the furnaces and boiler; and there is so little variation therefrom either in the description or the claim contained in the new specification, as to render it difficult to perceive the reason of the surrender; we presume, however, that the patentee would be able to furnish a good one. In the present instance, Mr. Disbrow has referred by letters to the drawings of his furnace, which, in every machine, renders the explanation much more clear than it can otherwise be made. In the former, he says that the object in view is "the application of anthracite or other coal to the purpose of heating," &c. In the present he says the "application of coal, or other fuel," &c.; intending thereby, probably, to indicate the use of wood. In the claim, as now given, he leaves out the words "he claims the mode of supplying such furnaces with coal by feeders passing into them from the

surface of the boiler;" the object of the surrender was, probably, the omission of this part of the former claim, which certainly could not have been sustained, whatever may be the case with the "combined furnaces."

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7. For an improvement in heating liquids, called the *Combined Furnace;* Levi Disbrow, city of New York, May 6.

The furnaces here employed are the same in form and substance with those described in the last patent. The difference in the thing claimed being that in the present instance the patentee speaks of the "application of heat to liquids in general, by means of two or more furnaces erected within the body of the liquid," &c. whilst in the former he says, "the application of heat to the boilers of steam engines by means of two or more furnaces for coal, or other fuel, erected within the boiler itself." To us the two things appear to be the same in form and substance; an impression which is fully borne out by the drawings. If the former patent was good, we do not perceive the necessity for the latter, nor indeed can it, if essentially similar, be valid. Were it so, the effect would be to lengthen out the first patent for nearly two years more than the term for which it was granted, and, upon the same principle, patents might be extended for an indefinite period.

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8. For *Boilers, or steam generators, and Wheels, for Locomotive Engines;* Stephen H. Long, Colonel of the United States Engineer Corps, May 6.

The improvements claimed in this patent are stated to be in addition to those described by the patentee in the specification of his patent of December 28th, 1832, which was noticed in the last volume; to this, therefore, we refer.

"The improvements described in this specification and specifically claimed as new and useful, are, 1st, the application of two or more horizontal, cylindrical boilers to locomotive steam engines, with flues leading through a portion of each, and, at the same time, one or more flues leading in the same direction exteriorly to the boilers, or between them and the apron. 2nd. the use of two or more horizontal cylindrical boilers with tubular flues, in connexion with a fire box. 3d. the introduction and use of steam chambers, disposed in such a manner as to enlarge the steam room within the boilers, while they reduce the quantity of water necessarily contained in the boilers. 4th. the construction of a grate with one or more oscillating bearers, the better to promote the combustion of anthracite coal or coke. 5th. a new method of causing a grate to traverse on an axle, by means of which the fireplace may speedily be discharged of its contents. 6th. the construction and application of a movable, or slip, chimney, on a new plan; and 7th. a new method of constructing wheels for locomotive steam engines."

We shall offer a slight sketch of some of these improvements, whilst others will necessarily be neglected, as they could not be well described without very extensive drawings.

The flues, or tubes, alluded to in the first item, are to pass longitudinally through that portion of each cylindrical boiler which is situated in rear of the fireplace.

The movable, or slip, chimney, consists of one chimney sliding within another, like the tubes of a telescope, with suitable contrivances for raising or lowering the sliding part in passing under bridges, &c.

What is the particular construction of the grate, with the oscillating bearers, we do not fully perceive, even with the aid of the drawings, which do not furnish any details, the model, which we have not seen, has probably been relied on to render this point clear, a proceeding, by the way, which we have repeatedly reprehended. By means of levers, which are attached to a pivot, or axle, one side, or end, of the grate may be let down, for the purpose of discharging the contents of the fireplace.

The wheels are to have cast iron hubs, with wooden felloes and spokes. The hubs are to be cast in two pieces, divided vertically through the boxes, or mortises, for the spokes, and having on one half a projecting ring, to fall into a corresponding hollow in the other. The two segments are to be secured together by suitable bolts, and are to be fastened to the axle by bolts passing through notches and mortises, in the manner of a linchpin. The spokes and felloes are to be made in the usual manner. The tire is to be made in two widths; one, which is the outer part of the rim, or tread, is to be flat, and of wrought iron; the inner portion is to be of wrought iron, or of steel, and is to be so formed as to rise conically towards the inner part of the tread, so as to adapt it to the different curvatures of the road. The flanch is to consist of a separate hoop of wrought iron, which is to be bolted on to the felloes on the inner side of the wheel. A wheel thus constructed the inventor denominates "the tripple banded wheel." It is proposed sometimes, however, to form the flat and conical parts of the tread of one piece, so that the wheel shall be double banded only, the flanch forming the second band.

The wheel, thus described, is not represented in the drawings, which certainly ought to have been done, in conformity with the requirements of the law to "accompany *the whole* with drawings and written references, whenever the nature of the case admits of drawings.

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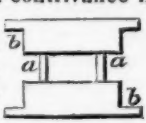
9. For a *Water Wheel;* Andrew M. Braley, and John L. Dyer, Montgomery county, Illinois, May 7.

The wheel described is intended to act either as a mill or as a paddle wheel, and is designed to obviate the resistance from back water. There is much ingenuity in the proposed mode of construction, but, as is not unfrequently the case, it is expended upon a contrivance in which it will not be of any practical utility. The opposite floats, or buckets, upon a wheel are to be attached together by rods, or bars, *a a*, which are to slide through mortices in the shaft, or drum, of the wheel; the projecting parts, *b b*, of the floats are to



act against circular segments, so placed as to lift out the buckets which would otherwise be obstructed by back water. It is proposed to apply the same principle to undershot, overshot, and paddle wheels, and also to the sails, or shutters, of wind mills. There is a number of figures in the drawings intended to illustrate the various modes of accomplishing these objects.

The perpetual shifting, the friction, and the consequent wear, would of themselves suffice to neutralize all the anticipated advantages of this contrivance; and one practical experiment, we are convinced, will, or ought to, satisfy the incredulous of this fact.

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10. For an improvement in the mode of manufacturing *Dead eyed wood Buttons*, being an improvement on his former patent; Degrasse Fowler, North Bradford, New Haven county, Connecticut, May 8.

The former patent, above alluded to, was obtained on the 13th of June, 1831, and is noticed at p. 333, vol. viii. Instead of surrounding the wooden button with a metal rim, as there described, the whole face of the wood is to be covered with metal, tin plate for example, and the holes are to be punched through the metal and the wood, which will sink the bur of the former into the latter, and leave the holes perfectly smooth. The edges of the tin may be turned down so as to form a rim on the back of the button. When so made they are said to be more beautiful, stronger, and cheaper, than upon the original plan.

The forming buttons upon this plan constitutes the claim.

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11. For an improvement in the *Thrashing Machine;* Hardin Branch, city of New York, May 9.

We noticed in the number for last month, p. 254, a patent for an improvement in the beaters of thrashing machines, obtained by Mr. Branch, to which the present is so similar as to require a seer of no ordinary penetration to perceive the points of difference. Were it allowable to tell tales out of school, we might, perhaps, throw some light upon this apparently obscure affair, but this is contrary to established rules, which we will not violate.

The heads of the cylinder are to be of cast iron, with openings in the centre for the shaft. Near the circumference of each head there are to be holes to receive the rods which are to hold the beaters, and serve as hinges upon which they are to turn; these rods are to have a head on one end, and a screwed nut on the other. The beaters are to be of wood, faced with iron, and are to have pins, or teeth, driven into them: they are to be hung to the rods in any convenient way. "The mode of hanging the beaters, however, I do not claim as any part of my invention." Good, but what is it that you do claim? this is the main question; an answer to which is required by the patent law, but which, as on the present occasion, very frequently does, and must remain unanswered.

12. For a *Medicine called Houck's Panacea;* Jacob Houck, city of Baltimore, May 9.

Why will men be so obstinate as to remain sick for a long time, and at last to die, whilst panaceas, combining nearly all the virtues of the long sought elixir of life, are prepared by so many seventh sons of seventh sons in all our cities, and offered for sale at the numerous stores with tinted jars at their windows? Listen, ye sons and daughters of the wan countenance and the distorted visage, to the list of diseases which the medicine now patented will effectually cure; aye, effectually, and for ever, if you will only take a sufficient number of bottles in a given time.

Dyspepsia	Thrush, or sore mouth
Loss of appetite	Putrid sore throat
Indigestion	Croup
Inflammation of the stomach	Inflammation of the heart
Heart burn	Dropsy
Diarrhœa	Rickets
Dysentery, or flux	Diseases of the liver
Cholera morbus	Jaundice
Consumption	Obstructed menstruation
Influenza	Difficulty of making water
Colds	Gleet
Coughs	Hysterics
Inflammation of the chest	Nervous and scrofulous affections
Palsy	Mercurial and venereal diseases
Gout	Ulcers
Rheumatism	Sores
Inflammatory sore throat	Affections of the skin
Whooping cough	All diseases from impure blood

We are sorry, as it would secure the patronage of many of the best men in our country in favour of the patentee, that Intemperance is not found upon the list; and as the first ingredient in the prescription is twenty-five gallons of whiskey, it seems that the omission was not a thing of mere accident. That the recipe may not be lost should the patent office be burnt, and the patentee become the victim of his own remedies, we will place it upon our pages, and thus insure to it extensive diffusion and continued duration.

Rye whiskey	25 gallons.
Gum guac.	25 lbs.
Sugar	150 lbs.
Oil of juniper	1 lb.
Oil of lemon	5 oz.

Mix, incorporate well, and bottle for use. Take one table-spoonful before breakfast, two at 11 o'clock, and two on going to bed. Increase or diminish the dose agreeably to the feelings.

If one or two bottles do good, take more until you are quite well; and after you are quite well take more by way of confirmation. Give less to your babes.

The foregoing is the pith and marrow of the discovery, and the

practice under it, and we think, upon the whole, that the inventor merits the "everlasting" fame of Cromwell. Any one who should give this medicine in "inflammation of the stomach," "inflammation of the chest," and various other complaints in the enumerating list, ought to be made the subject of a presentment before a grand jury.

The patent law requires that an invention should be "useful," which has been defined to mean useful in contradistinction to frivolous, or mischievous. In the case of Lowell *v* Lewis, (1 Mason, 186,) Judge Story, in his charge to the jury, is made to say, "The word *useful*, therefore, is incorporated into the act in contradistinction to mischievous, or immoral. For instance, a new invention to poison people, or to promote debauchery, or to facilitate private assassination, is not a patentable invention." Under this view of the case, many a quack medicine, and this panacea among them, could not sustain, in court, its claim to legal protection. But who is to prove the injurious tendency of such a nostrum? no one, of course, but the instructed and regular practitioner; and if the charlatan has the good fortune to get his prescription condemned by such men, he obtains notoriety, and the sympathy of the vulgar, is considered as the victim of interested persecution, and thenceforward has a fair chance to roll in his carriage. Should the hopes of the philanthropist ever be realized in the universal diffusion of sound knowledge, this, among many other public evils, the result of ignorance, may find a remedy; otherwise we may continue to say, "as it was in the beginning, is now, and ever shall be." And let all the Quack Doctors say Amen.

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13. For a *Perplexing, or unpickable, combination Door Lock;* J. C. Leopold Daubreville, Ramapo Works, Rockland county, New York, May 13.

There are fifteen figures, and several of them not a little complex, referred to in the description of this lock; we shall therefore at once accede to the correctness of its title, and not perplex ourselves to pick it. All we can offer upon the subject is, that if the patentee will send us an engraving of his lock, and a copy of his description, we will give to his invention all possible publicity; a thing which, otherwise, we cannot attempt, although we have been informed by a competent judge that there is much merit in it.

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14. For an improvement in the construction of *Gearing for Horse Power;* Smith Gardner, Auburn, Cayuga county, New York, May 14.

The vertical shaft which is turned by the lever to which the horse is attached is to have upon it a toothed wheel of three feet in diameter; this takes into a pinion of ten inches, having a wheel of thirty inches diameter on its shaft; this wheel takes into a pinion of about seven inches, with a wheel of about twenty-five inches, which in its turn drives a pinion of about five inches, and this has a whirl, or pulley, upon its shaft, to receive a strap, or band.

There is not any thing claimed, or any thing to claim, as the whole

affair is a simple arrangement of wheels and pinions to get up the desired speed, without the slightest pretension to novelty in the arrangement, or in any other respect.

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15. For a *Fire Alarm;* James Dinsmore, Milburn, Somerset county, Maine, May 14.

This fire alarm is perfectly similar in principle to one noticed at p. 117, vol. ix., patented by J. S. Richardson, of New Hampshire. The alarm part resembles that attached to clocks, having a weight to it, which, in its descent, will cause a bell to ring. A latch prevents the running down of the weight, and a string connected to this latch is led over pulleys, and, like bell wires, around the apartments where fires may be likely to happen; when this string is burnt off a small weight is thereby liberated, which lifts the latch, and the alarm is sounded.

There is no claim made, and, the thing having been before effected on the same principles, there is nothing to claim.

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16. For a *Washing Machine;* James B. Dunkin, Union, Loudon county, Virginia, May 15.

This machine is like a barrel churn, revolving in a trough, but instead of being cylindrical, it is octagonal. Upon two opposite boards, forming the octagon, there are pins placed which project inwards, to cause the clothes to turn about.

The claim is to "the before described machine," and it certainly was best to claim it by wholesale, as when divided into its component parts, it would be difficult to find a new feature.

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17. For a *Standing Press;* Samuel Fairlamb, city of New York, May 15.

This press is to have the head and foot blocks of cast iron, with four wrought iron bars forming the cheeks, one at each corner, keyed above and below. In the centre of the head block is a female screw; at the lower end of the press screw, there is a bevel, or crown wheel, and the end of this screw swivels in a collar by arched piers attached to the platen. A horizontal shaft runs in bearings upon the platen, and a pinion, or small bevel wheel, on this shaft, takes into the teeth of the wheel on the lower end of the screw. There is a second pinion upon the opposite end of the horizontal shaft, which, however, is loose, as it is to operate only as a friction, or bearing, roller. There are cross bars on the end of the horizontal shaft, by which the press is to be operated upon, until the resistance transcends their power, when a compound lever is to be brought into action. For this purpose a ratchet wheel is fixed upon a horizontal shaft, within the cross bars. The compound lever is to be worked up and down like a pump handle, and has its fulcrum at one end, turning upon a pin projecting from one corner of the platen. A catch, having its lower end about four or five inches within the fulcrum of the lever, takes hold,

by its upper end, of the teeth of the ratchet wheel, and thus operates upon the press.

The claim is to "the application of the compound lever and ratchet wheel, to a standing press, and the fixture of the horizontal shaft, and the method of gearing the wheels."

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18. For a *Balance Lever Machine, for propelling machinery by water power;* Lucius H. Emmons, and George Upham, the former of Wellsburg, Brooke county, Virginia, the latter of Massillon, Stark county, Ohio, May 16.

A lever is to vibrate upon gudgeons, like the lever beam of a steam engine; from the centre thereof rises an arm, like the index of a scale beam, and a connecting rod, or pitman, from this arm, leads to the crank on a fly wheel shaft. The flume of the mill extends from one end of the beam to the other, and through gates, which are alternately raised and lowered, water flows into buckets, one of which is hung upon each end of the lever beam. The water causes these buckets to descend, alternately, and is let out by some suitable contrivance, when the bucket is down.

The drawing is very well executed, but there are no references to it, and therefore there are some matters of detail which are not rendered perfectly clear. The claims are "the application of the balance lever to water power; the peculiar construction and use of the buckets; the peculiar construction and use of the bucket rods; the form and peculiar construction of the gates and floom; and the whole as a machine for driving mills, and all kinds of machinery by water power."

This apparatus is intended to be used where the fall is not sufficient for the application of a wheel, but we are convinced that it will not answer well in practice. The fly wheel must be kept in perpetual and equable motion, to do which the buckets ought to be filled and emptied suddenly, which cannot be done. As respects the application of the balance lever to water power, or the obtaining of motion by the alternate filling and emptying of buckets, those who are acquainted with the history of hydraulic machines need not to be informed that a claim to these points would trench upon the doings of the ancients.

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19. For an improvement in the *Manufacturing of Horse Collars;* Horace Holton, Rochester, Monroe county, New York, May 16.

The specification of this patent tells us how to cut the leather for a horse collar from leather which is soft, and which will bear crimping, and also from leather which is too hard to crimp; but we are not informed in it wherein the method described differs from that followed by others; as we have never entered very deeply into this subject, we cannot supply the deficiency, or tell the patentee what he ought to have claimed, a point in which he does not, himself, appear to have been informed.

20. For *Blowing Blast Furnaces;* John Steece, Laurence county, Ohio, May 17.

The specification does not say one word about blowing blast furnaces, but merely tells us something about the tuyere through which the blast is to be conducted; and what it says about this, is not very luminously set forth, nor is there any thing to indicate where we should look for the novelty of the invention. To enable the cognascenti to judge for themselves, we will give an epitome of the whole specification.

The tuyere must be of sufficient substance; it should be of cast iron, about eight inches long, conical, and with a hole through it; the smallest end to be about the size of the pipe where the air is discharged, and the largest end of a size to admit the blow-pipe, and remove the cinders. The thickness may be about five-eighths of an inch at the small, and three-eighths at the large end.

Preparation for receiving it must be made in the tuyere arch, with good clay mortar, when the tuyere is to be pressed in, in a proper place and direction for conducting the air into the furnace, and all is then done.

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21. For *Friction Rollers;* George Danforth, Centreville, Wabash county, Illinois, May 17.

We have here Mr. Garnett come again. A row of rollers, connected by gudgeons working freely in holes in two rings, are to surround a shaft or axle, and to roll within a box or hub, and this "is believed to be original" by the patentee. How many years Garnett, the inventor of them, has been dead, we know not; but this we know, that they have been pictured in nearly every book of mechanics, in all the languages of Europe, for half a century, at least.

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22. For a *Thrashing Machine;* Edmund Warren, city of New York, May 17.

The cylinder of this machine is to be made of wood; the beaters or teeth consist of separate pieces of cast iron, notched across, and are to be fastened, in rows, on to the cylinder by means of iron hoops, notches being cast in them to receive the hoops. The concave is of iron bars, and the frame is in the form of a rectangular triangle, or rather of the quadrant of a circle, standing on one of its straight sides. The claim is to the segments and hoops of the cylinder, and the form of the frame for cheapness.

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23. For an improvement in the *Grist Mill;* Luther Olds, Onconta, Otsego county, New York, May 18.

This portable grist mill is, in its general construction, like many others; but it claims to be improved in the form and action of the bridge tree; in the manner of hanging the runner; and in a mode of blowing air through the eye of the runner, so as to pass between the stones, which is to be accomplished by revolving fans running within a drum, by a blast from bellows, or from a fall of water. We are

told that by these improvements friction is reduced, greater speed obtained, less propelling power required, and the flour is kept cool.

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24. For an improvement in the mode of *Dressing Woollen Cloth, and cloth partly of wool, and partly of cotton;* Calvin W. Cook, Lowell, Middlesex county, Massachusetts, May 20.

We are informed that the patentee of the above named improvement is engaged in experimenting in order to render his process as perfect as possible, and may probably find it necessary to obtain a new patent when his experiments are completed; we therefore omit any notice of the invention until we can present it in its most perfect form.

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25. For apparatus for *Generating Heat for the Forging of Malleable Iron, and of Steam for driving machinery;* Peter J. Clute, city of Schenectady, New York, May 20.

A steam boiler is to have under it a number of furnaces, which are to be used for the double purpose of heating iron and of generating steam. The kind of boiler preferred is the ordinary cylindrical boiler, and the furnaces stand in a row, transversely to the boiler, the furnace doors being at the sides of the stack by which it is supported. As regards the number of furnaces to each boiler, the following is given as an example. If the boiler be twenty feet long, and thirty inches in diameter, there may be seven furnaces, which may be of the following dimensions, or proportions. Distance of the grate from the boiler, one foot; length of grate eighteen inches, width eight inches; the width of the furnace must be governed by the grate. There is to be to each furnace an aperture at either end, of eight inches in width, and six in height, for the admission of coal. The distance between each grate, it is said, is to be three-eighths of an inch; this, we suppose, means the distance between the bars of the grate, as we cannot perceive how seven grates, each eight inches wide, can be made to extend twenty feet, if they are only three-eighths of an inch apart.

Under each grate there is to be a box, called a receiver, by the patentee; this is to serve as an ash box, and a receiver for a blast of wind, which is to be blown into each furnace. A blowing cylinder is to be worked by a steam engine supplied from the boiler, and each furnace has a pipe which terminates in the box below the grate, all of which pipes are fed from one common main. An aperture, six inches in width, and three in height, is left, at each furnace, for the introduction of the iron to be heated, valves closing them when not employed.

Whether the furnaces are to be divided from each other by a partition wall, or whether there is to be any particular arrangement of the flue, or flues, are circumstances not alluded to in any way.

The claims are to the using a number of furnaces to raise steam; the heating the boiler at many different points; the employment of the steam raised by these furnaces to the blowing of the bellows; the application of the blow-pipe to ignite anthracite for raising steam; the using the same fire for the double purpose of heating iron and raising steam, this latter being considered as the most important feature

of the invention. Among the things enumerated to which this apparatus may be applied, is the propelling of boats; but if the distinguishing feature of using the furnace for heating malleable iron, whilst the heat generates steam for driving machinery, be retained, there must be a travelling smithy on board the boat, a thing which some passengers might not approve.

The claims are certainly too general, "the using a number of furnaces to raise steam," is a thing which has been repeatedly done, or proposed. The surrendered patent of Mr. Disbrow, noticed at No. 6, in the present list, was for using a number of furnaces to raise steam. The employment of a portion of the steam power to blow the bellows, does not carry with it the idea of originality, however original it may be with the patentee.

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26. For a *Mathematical Measurer for the use of Taylors;* Daniel Williams, city of New York, May 22.

When Dr. Gregory published his "Mathematics for Practical Men," we were apprehensive that he was more liberal than correct in taking it for granted that all mechanics understood algebra; we have now, however, so many mathematical measures introduced by one class of mechanics as to afford a presumption that the estimate of the Doctor had some foundation in fact.

As we have already put in the plea of *non-compos*, when the art of cutting cloth in such a way as to adapt it to the various contours of the human form, is the subject of discussion, we shall not attempt to give a particular description of this new instrument for the laying down of plain and spherical triangles for this purpose; we will remark, however, that the base of the instrument is a straight scale, having spirit levels at each end, to place it horizontally upon the back, or elsewhere; and that there are two measures divided into inches, rising rectangularly from it, intended to ascertain the latitude, longitude, or declination of the body terrestrial. We presume that there is much of novelty in the affair; and the patentee appears to think it altogether new, as he has not made any claim, either particular or general.

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27. For an improvement in the *Paddle Wheel* used for steam or horse boats; James P. Espy, city of Philadelphia, May 22.

(See specification.)

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28. For an improvement in the *Enema Syringe;* John Pearshall and David Gilbert, Gettysburg, Adams county, Pennsylvania, May 22.

This syringe is undoubtedly new in its construction, and so far is entitled to a patent. It is made in part of pewter, and in part of a caoutchouc bag; the portion made of pewter is somewhat in the form of a common syringe, but with the body part short, and having a tube at each end; on the middle of the body part there is a small opening with a neck, to which the caoutchouc bag is to be attached, which then stands at right angles with the body of the syringe. One of the

small tubes is to be passed into the rectum in the usual way, the other is to curve so as to dip into a vessel containing the liquid injection; on the inner end of this latter tube there is a valve opening inwards, towards the body of the syringe, and another valve opens outwards at the inward end of the injecting tube. The caoutchouc bag is to be squeezed together, and then, on allowing it to expand by its own elasticity, it will draw the fluid into itself from the containing vessel, which, on squeezing it, will be injected; this operation is to be repeated whilst it is deemed requisite. The pewter part of the instrument screws together for adjusting the valves, and for convenience of package.

Although we believe the contrivance to be new, we do not think it likely to go into general use; the two valves will be troublesome when used with the tenacious kind of fluid frequently employed, and the administration will be much less convenient than with the more common instruments.

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29. For *Manufacturing Clock Wheels and Pinions* by casting them with their teeth and leaves; James S. Seger, city of New York, May 22.

Moulds are to be made in which the wheels and pinions of clocks are to be cast in a finished state; tin, or any other suitable metal being employed in their formation. The claim is to the "manufacturing of clock, or time-piece wheels, by casting them with teeth in them." We believe that there has been another patent taken out with a similar view, but have not taken time to examine it.

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30. For a *Sheet Iron Fireplace;* Jesse Ingalls, Sandbourton, Strafford county, New Hampshire, May 23.

The jambs of this fireplace are to be covered with sheet iron, the back being brick, as usual. The flue also, to a considerable height, is to be of sheet iron. The sheet iron forming the front of the flue should, at the lower part, be as wide as the throat of the chimney, but it may be narrowed, pyrimidically, as it ascends; at the upper end of it, the brick flue of the chimney commences.

The usefulness of this flue is said to consist in its "warming a room in less time, and with a less quantity of fuel than any other fireplace now known." It is proposed sometimes to carry the sheet iron up through the ceiling of a room, into that next above it.

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31. For an improvement in the *Vibrating Steam Engine;* Nathan Rowland, Philadelphia, May 24.

This engine is, confessedly, very similar to that patented by Mr. Costil, of Philadelphia, about two years since, the main difference being in the manner of arranging the parts which operate as valves. The cylinder is to vibrate on trunnions at its centre. The steam pipe consists of a flat tube, placed usually on the under side of the cylinder, and curved so as to form an arch, of which the trunnions are the centre. This tube is faced truly, and has in it two

steam ways, leading from near its centre to either end of the tube. Under this is a concave steam box, fitted exactly to the arched steam tube, so as to form valve seats; in this there are openings for the alternate admission of steam to, and its discharge from, each end of the cylinder. The steam box is to have its bearings regulated by screws.

We are not aware of any advantage which this mode of arranging engines offers above that of Mr. Costil, and the fitting of the valves will, we apprehend, be attended with somewhat more difficulty.

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32. For an improvement in the mode of *Boring or Rimming Holes, either straight or curved,* by an instrument denominated "The Compound Slide and Groove Borer, or Rimmer;" Zebediah Holt, Chelmsford, Middlesex county, Massachusetts, May 27.

This apparatus is intended to bore, or rim out, hubs, and boxes, of any kind required for machinery, so as to give to the longitudinal section of the hole either a straight or curved form, as may be desired. Suppose a hub, or box, to be fixed in the lathe, and it is desired to rim it out barrel shaped, that is, larger in diameter in the middle than at either end; a mandril is to be inserted to serve as a guide to the cutter, and in order that it may perform this office in the way desired, a groove is made along the mandril, in which groove the cutter is to slide; were the mandril cylindrical, and the grooves of equal depth, the cutter advanced along it would cut the hole cylindrically, but if the groove is of less depth as it advances towards the centre of the hole, the cutter will be forced outward, and cause the bore to be larger there, and will throughout its whole course conform to the curvature given to the bottom of the groove.

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33. For an improvement in steam power, by means of the "*Horizontal Steam Engine;*" Charles Curtis, city of New York, May 28.

On account of the numerous difficulties attending the construction and use of rotary steam engines, it has been generally attempted to give to the working parts the utmost simplicity of which they are susceptible, but even with this precaution they have hitherto been failures. If we admit the *prima facie* evidence of the engine before us, we think that it will go far to prove that there was a conviction in the mind of the inventor that nothing more than complexity was necessary to remove the difficulty; and that as regards the description, which the law says shall be "full, clear, and exact," these requirements were best fulfilled by furnishing one which is altogether general and obscure.

We have pored over the affair as long as we dare without neglecting the calls of other inventors, and we leave it with the impression that we had much rather receive the money which a well made engine of this construction would cost, than the probable product of its operations during the term for which the patent is granted.

34. For a *Safety Steam Boiler;* Charles Curtis, city of New York, May 28.

A safety boiler is a very desirable thing, and should the one here patented justify its name, the inventor has our best wishes for a most substantial reward; were we to venture upon augery, however, it would be under auspices which we should deem unfavourable. We here find some difficulty from the same cause as that which we mentioned in the last article, namely, the obscurity of the description. That our readers may judge between us and the inventor on this point, we will make a quotation from the first part of the specification, which is as follows:—

"First. Seven boilers, more or less, made of copper, wrought iron, or other suitable metal, in form of a circle two inches in diameter, more or less, and forming a circle of nearly ten inches in diameter, the shells of which are one-fourth of an inch thick, more or less, all of which boilers are placed upon a frame, in a perpendicular position, close to each other."

According to the best of our judgment, aided by the drawing, we suppose that each of these boilers is to be in the form of a shallow drum; that they are to be bolted together, so as to form, when united, a cylindrical boiler, consisting of seven compartments, and that the fire is to be made in the middle of them; for which purpose, the centre of each drum, excepting the last, is removed, and a common furnace thus formed. These separate parts are to be connected by tubes, and other tubes are to lead from the upper part of them into a steam chamber. There must, of course, be smoke flues, supply pipes, and other appendages, some of which are described, if description it may be called, where the style and manner throughout are in perfect keeping with the quotation above made.

The claim is to "a boiler in the form hereinbefore specified, particularly the form of each boiler which composes the main boiler."

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35. For a *Composition for Painting*, called the Stone Composition; Elijah Skinner and John Webster, Sandwich, Strafford county, New Hampshire, May 28.

Pulverized fire stone, or soap stone, is to be ground in oil in equal quantities with white lead; and the claim is to "the introduction of this particular species of stone into the common composition of paints."

Whether this particular species of stone has, or has not, been ground with oil to paint our houses, we do not know, although we recollect many other earthy matters which have been so used, such as gypsum, barytes, chalk, road dust, &c.; it, however, enters into the composition of paint for another purpose, namely, the cheeks of ladies, being one of the ingredients in rouge. As the paint of the patentees is to be ground in oil, and as the ladies have a prior right, there will not, we presume, be any dispute between them.

36. For a *Fireplace;* Levi Mansfield, New Hartford, Oneida county, New York, May 29.

This contrivance is most imperfectly described, refers throughout to a model, and makes no claim to any thing; yet, from its style, we apprehend that it is drawn up by a gentleman learned in the law. This new fireplace is to be placed within that usually found in a room, and, we suppose, that it is to be made of cast iron. The hearth is hollow, consisting of a shallow box, having two holes at the front corners for the admission of air, which air, we are told, "is carried into the main flue of the invented fireplace by two smaller flues, one on each side of the invented fireplace." The fire is represented as being made in a grate, like that commonly used for anthracite; the purpose, therefore, of carrying the air from the hollow hearth into the main flue, back of the fire, we cannot guess.

The main flue is to be made wide, and shallow, behind the fire; the plate against which the fire rests is to operate as a kind of register, being hinged at bottom, and falling back so as to regulate the opening for the draft. At a little distance up, the flue is contracted, and so formed as to receive a round pipe, which is to be returned by an elbow through the chimney, into the room, and conducted wherever it may be required. "An extra movable back, which is concave, is to be used when the fireplace is used for cooking;" and this is all the information given as relates to this part of the invention; the apparatus appears to be as happily conceived, as its construction is felicitously described.

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37. For the *Application of Steam to the Heating of Liquids;* Joseph B. Armstrong, Wilkes county, Georgia, May 29.

This new application of steam consists in the conveying it in two or more tubes, instead of in one only, into the liquid which is to be heated; or in conveying it in a single tube to the vessel containing the liquid, and then divided so as to pass through two or more tubes. "as the heating power of steam is greatest when most divided."

If the patentee had been a subscriber to, and had read, the Journal of the Franklin Institute, or any of the works which describe the different mechanical inventions of the day, he would not have taken a patent for a general principle, which has been carried into operation in sugar boilers, and other evaporating vessels, under numerous modifications; as he then could not have avoided knowing the fact.

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38. For a *Machine for Hulling Cotton Seed;* Laucelot Johnston, Madison, Morgan county, Georgia, May 29.

An outer case is made of strong timber, or staves, hooped together, in the form of the common churn. It may be fourteen inches in height, ten inches in diameter in the clear, at top, and twelve at bottom. Into this a wooden nut is fitted, to run vertically, the shaft of which is extended below the machine so as to receive a whirl, for a band. The inside of the case, and the surface of the nut, have cast steel teeth set in them spirally, which, in the one in use, amount to five thou-

sand. A hopper at top, is used for feeding. Motion is given to the whirl by the common running gear of a cotton gin.

The patentee says that the foregoing machine hulls 150 bushels of seed in ten hours, producing fifty bushels of clean seed, which is separated from the hull by passing over an inclined screen, kept in motion by a knocker. The hulling, it is said, is effected by cutting, and not by rubbing.

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39. For an improvement in the method of *Casting Boxes for Carriage Wheels;* William Butler, and Edward B. Rice, Worcester, Worcester county, Massachusetts, May 31.

The object in view is to make cast iron boxes which shall be hard and smooth in the inside, so as to be durable, and not to require boring, or rimming out. The method of attaining the end, for which this patent is obtained, is the using of a hollow metal core: that which the patentees have employed being strong sheet iron, truly turned. The sheet iron, it is said, heats readily by the pouring of the metal upon it, and thus becomes expanded; whilst, by its cooling more rapidly than the body of the box, it contracts, and is readily detached from it, when the work is taken from the flask. With a solid core this is not the case, the metal being set before the core has undergone much expansion, which causes the box to crack, or to adhere so firmly to the core that it cannot be removed.

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40. For a *Propelling Horse Power;* Gilbert Griffen, Greece, Monroe county, New York, May 31.

This machine is made just like the old fashioned horse mill, but the large crown wheel is at the lower end of the vertical shaft, has the teeth on the lower side of it, and takes into a pinion, the horizontal shaft of which works in a trough under the feet of the horses. The levers by which the horses draw, are, of course, above the driving wheel.

Specifications of American Patents.

Specification of a patent for an improvement in the Paddle Wheels of Steam-Boats, and Horse-Boats. Granted to James P. Espy, *city of Philadelphia, May* 22, 1833.

The paddle wheels now in use are constructed on the principle, which is false, that if the paddles were closer together, they would each strike on water that is already in motion from the action of the paddle which entered just before it, and that the power of the wheel would be thus diminished, whereas my wheel is constructed on the principle that the thinner the slices of water are cut the better, with the limitations hereafter mentioned. Again, the wheel now in use is constructed with the paddles so wide apart, that each paddle can derive no advantage from the water that comes in between from be-

low and at the sides, in consequence of the removal of the water by the paddle which entered the water next before it; for it rises out of the water without coming near it, whereas my wheel is constructed so as to take advantage of this water, and increase its quantity.

In the paddle wheels of steam-boats and horse-boats now in use, constructed according to the received theory given by Renwick, on the Steam Engine, page 272, and Tredgold, page 318, it does not appear that as many as twenty consecutive paddles are ever employed on one wheel, and the number is generally much less; now these paddles are so far apart, that notwithstanding their backward motion is greater than my wheel will be, they enter the water and pass out of it, leaving, in consequence of the forward motion of the boat, large portions of water untouched, and of course its inertia unemployed in propelling the boat forwards, thus a less effect is produced than would be if all the intervening water should be put in motion with a velocity equal to the paddles themselves. These defects I propose to remedy by increasing the number of consecutive paddles from twenty to one hundred, or upwards, as may be found convenient; and thus by cutting off thin slices of water, each paddle will be enabled to move, with its own velocity, all the water between it and the contiguous paddle, and also take advantage of, and increase by the great number of paddles, the quantity of water which may come in between the paddles, from below and at the sides, in consequence of the removal of the water by the paddle next before it; certainly on the present construction of the paddle wheel, no advantage is derived from this new accession of water.

According to this view of the subject it appears diametrically opposite to the universally received theory and practice, (see Renwick and Tredgold, as quoted above,) that the *greater* number of paddles the better, provided they could be made indefinitely thin, and without friction in the water. In practice, however, the thickness of the paddles, even if made of sheet iron, and very thin, as they should be, bear some proportion to the intervening spaces, and therefore, it is believed (though the exact number producing a maximum effect has not been ascertained by experiment,) that about sixty or seventy consecutive paddles will be the most suitable number for wheels of about twenty feet in diameter. If the wheels are smaller it may be desirable to use a less number, though I have found by experiment that with wheels of twenty-six inches in diameter, forty-eight paddles are better than twenty-four, or twelve, though the paddles were only about one inch and three-quarters apart when forty-eight were put on the same wheel.

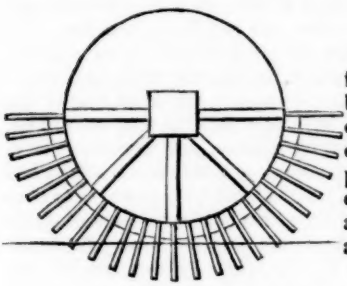
It is, perhaps unnecessary to add, that all the effects of violent percussion and irregularity of motion, will be more effectually obviated by the great increase of the number of paddles, or floats, than by the tripple paddle wheel, the most approved one now in use, which Mr. Renwick, (p. 272,) says was introduced by Mr. Stevens, and which evidently derives its popularity from the universal belief that it would not do to put the paddles so close together as to obviate this difficulty; for though my paddles reach across the whole face of the

wheel, eight or twelve being in the water at once, each receiving, contrary to the existing theory, almost as much reaction from the water as if it was in alone, the shock which *one* makes on entering the water cannot be felt.

The drawing deposited in the patent office represents a section of one half of the wheel which I used in my experiments to demonstrate the truth of the theory advanced by me above; it was twenty-one inches in diameter, and the paddles forty-eight in number, eighteen inches long, that is, the whole breadth of the wheel, and three inches deep in the water.

What I claim as new, and as my own invention, or discovery, in the above described paddle wheel, and its operation, is, that a greater effect, from the inertia of the water, is produced by the introduction of a greater number of consecutive paddles, than was ever before used. on the prinicple of putting all the water in motion with the same velocity as the paddles themselves, and also that which comes in between the paddles in consequence of the removal of the water by the paddles as they move through the water, as explained above. I ground my claim on the discovery of the fact, confirmed by experiment, that forty-eight paddles, contrary to the received theory and practice, as explained above, are better than twenty-four, or twelve, succeeding one another in the same wheel. And I therefore claim the exclusive application of a greater number of consecutive paddles to paddle wheels than have ever been used before; thus taking advantage of the above explained principle and fact by me discovered.

JAMES P. ESPY.



Section of half a paddle wheel of forty-eight paddles, which proved by experiment to be superior to one of twenty-four paddles, and also one of twelve. There are eight paddles in the water at once, each of which, it is believed, does nearly as much work as if only one was in at a time.

ENGLISH PATENTS.

To JOHN LIHOU, *Esq. for his invention of an improved method of constructing Capstans. Sealed 10th January* 1832.

The object of the inventor is to construct a capstan capable of exerting great power in raising the anchor, and which may be worked by a smaller complement of men than ordinary capstans or windlasses—a matter of very great importance on ship-board, in boisterous weather.

The following is the specification, to which no drawings are appended:

The nature of my said invention is to facilitate the use of capstans on board ships and other vessels; and which said invention is more particularly applicable (though not exclusively) to capstans with two bodies, commonly called double capstans, as the same are used on board the larger description of ships and other vessels; and the manner in which my said invention is to be performed with reference to such double capstans, is as follows:

I use a strong, horizontal, bevel-toothed wheel, made of iron or other suitable material, which is to be firmly secured on the drum-head of the lower body, or on the lower body, as hereinafter is mentioned. By the word "body" I mean the barrel, with the whelps attached thereon. The diameter of the said wheel should not be less than the usual diameter of the said drum-head, but as much larger as it can be conveniently made, without being in the way of the men when engaged about the duties of the ship. This wheel is to be actuated by a suitable pinion made of iron, or other suitable material, or by two or more such pinions, which are to be worked independently of each other. The diameter of each of the said pinions may be generally made equal to about one-fourth, one-fifth, or one-sixth of the diameter of the said horizontal wheel, more or less; the particular dimensions of such pinions being adapted to the production of the power to be derived therefrom; the axle or axles of the said pinion or pinions being placed in a horizontal position, and supported or retained by, and between, suitable frames or braces made of iron, or other suitable material, attached to the beams or carlings of the deck, immediately over the said pinion, or pinions, by which arrangement the space below the said pinion, or pinions, will be kept quite unoccupied and unincumbered for the ordinary duties of the ship.

The said pinion, or pinions, are to be thrown in and out of gear when required, by any one of the well known mechanical contrivances commonly used for such purposes, and may be actuated by hand or by any other means.

When the said pinions are to be worked by hand, there is to be attached to the axle of each of the said pinions a strong crank handle, or winch handle, or a series of crank handles, or winch handles, which ever shall be found most convenient, according to the number of the men required to work the same. The axle of the said crank handles may be entirely supported by frames or bearings, attached to the beams or carlings of the deck above, (as already described for the axles of the pinions,) or the said axles of the crank handles may be supported by the deck stanchions; the pinion, or pinions, being so placed as to work in a fore and aft, thwartships, or other direction, as will be most convenient for working. For this purpose, in vessels of war I recommend that two pinions be used, and so placed as to be worked, one afore, the other abaft, the said lower body in midships; which positions will be found to interfere least with the men employed about the duties of the ship.

The axle of the said pinion, or axles of the said pinions and crank

handles, must be respectively placed at such a height from the deck on which the said lower body revolves, as will enable the men to work the cranks to the greatest advantage; and the drum head of the lower body must be placed at a suitable height from the same deck accordingly; and, if the drum head of the lower body be too high to admit of the before-mentioned horizontal wheel being fixed upon the drum head, at a suitable height between decks, for the axles of the pinions to be properly placed for working the crank handles to the greatest advantage, in that case the said drum head may be entirely removed, and the said horizontal wheel is to be fitted to bind the lower body together, instead of the said drum head, the centre part of the said wheel forming a suitable and efficient drum head (which may be furnished with bar holes if required,) thus leaving more room for the messenger to pass round the whelps, than if the drum head had been lowered.

In this capstan, I use a spindle of wrought iron, or other suitable materials, which said spindle is firmly connected or attached to the upper drum head and upper body with which it revolves in its bearings; but the lower part of the said spindle is to be perfectly round, and to turn freely in the centre of the lower drum head and lower body; but, when it is required to connect the said lower body with the spindle and upper body, I propose to use a clutch moving up and down on the said spindle. This clutch may be easily put in and out of gear by means of a lever or any other similar well known contrivance, but this is no part of my invention.

By the foregoing arrangements it will be seen that the lower body being attached to the spindle by means of a clutch, the upper and lower bodies may be worked by means of my said horizontal wheel and pinions, without the use of the capstan bars, or the capstan bars may be used in the ordinary way at the drum head of the upper body, at the same time that the wheel and pinions below are being worked, in which case the power acquired by the machinery, and the power acquired by the bars, will be combined, and the power of the capstan in both bodies will be thereby materially increased; or the pinions may be withdrawn or thrown out of gear, as above described; and thus, both the upper and lower bodies worked entirely by the bars in the drum head of the upper body, as in the ordinary mode of using capstans. Also, by lifting up the clutch and detaching the lower body from the spindle, the lower body may be worked by means of the said wheel and pinions, while the upper body and the spindle remain stationary, or the upper body may be worked by the capstan bars in the ordinary way, and the lower body can, at the same time, be worked by means of the wheel and pinions in the same direction, and at a different velocity from that of the upper body, or the upper and lower bodies may be worked at the same time in contrary directions, whereby the said double capstan may be made to perform the office of two separate and detached capstans, or unite their powers, without the inconvenience of applying bars to the drum head of the lower body; and by these means the use of capstans is very materially facilitated.

When the said pinions are actuated by hand I propose as a greater

security to the men working the crank handles, to increase the number of times which the capstan shall paul or catch during each revolution; for this purpose, I recommend that the hanging pauls shall be eight in number, and that there should be eighteen stops or catches for the same; half the said number of pauls to be of one equal length, and the remaining half of another equal length, in order that the capstan may paul thirty-six times during each revolution; but this is no part of my invention.

The above described method of fitting a double capstan may, in many cases, render the upper body unnecessary. In every such case a double capstan may be converted into a single capstan by merely removing the upper body, and either letting the spindle through the deck below, (as is usual in single capstans,) or by cutting it off even with the deck above. I therefore do declare, that my claim extends to the adaptation of my said invention to single capstans, as well as double capstans, whenever the former are situated between the decks of a ship; and further, single capstans may have the advantage of my said invention, by fixing the above mentioned horizontal toothed wheel securely to the spindle below the deck on which the said capstan revolves, so as to be worked by a pinion or pinions as hereinbefore described, and such single capstan may be situated either on the upper deck or elsewhere; I therefore claim the exclusive privilege of constructing capstans with the horizontal toothed wheel attached to the drum head, or fixed to the top of the body, or to the spindle of capstans, and worked by means of pinions applied in the manner hereinbefore described.

An ingenious mode of hanging the rudder of a large ship was also invented by the patentee, (see vol. iv. of our second series, page 64,) which appears to have been approved, and very extensively adopted by the Navy, and we understand that the Admiralty have, in consequence, promoted the inventor to a Captaincy. EDITOR.

[*Lond. Jour.*

Patent granted to JONATHAN DICKSON *and* JAMES IKIN, *Engineers, for improvements in the process of making Gas from Coals or other substances. Dated February* 6, 1832.

This invention consists of three improvements in the apparatus and process of making gas. First, in the manner of setting the retorts, and means of applying the fuel. Secondly, in a mode of cooling, condensing, and purifying the gas by absorption in a vacuum; and, thirdly, in a manner of producing a vacuum to the apparatus connected with the retorts, whereby such apparatus and retorts are not subject to pressure. First, of the setting the retorts. The patentees state that the common way of heating retorts is to keep a small quantity of fuel in a high degree of combustion, and by the assistance of a chimney or other means, a strong draught or current of heated air and flame is caused to pass in various directions amongst and against the retorts,

which are placed in what is called an oven, or furnace, and in this oven, or furnace, brickwork or other guards are generally placed between the fire retorts to save them from the intense, destructive heat, and to disperse the flame and current of heated air. Now the object of the first improvement is to keep a large quantity of fuel in a low degree of combustion, and closely shut up in chambers of brickwork or other materials, which chambers are called kilns. In these kilns the retorts of any shape or size are placed, in any position, in immediate contact with, and surrounded on all sides by, the fuel which heats them; consequently, these retorts will generally have the same degree of temperature as the ignited fuel that touches them, and this heat is regulated by the admission of atmospheric air through holes or openings, having doors, or dampers, for the regulation of such admission. By this improvement the patentees state that the operation of distilling gas may be conducted without the aid or use of a chimney, and by only burning coke, or cinders, and thus obtaining a considerable saving in fuel. The drawing attached to the specification represents ten retorts set in brickwork, leaving a space all around, which is filled up with coke, closely in contact with all parts of the retorts, which, when lighted, becomes one mass of fire, and the same may be kept at a regular temperature, by means of the quantity of atmospheric air admitted. By this improvement the patentees conceive that a great saving will be effected, particularly in fuel, as the object is to use coke in the place of coal, whilst, at the same time, the retorts not being subject to violent draughts, and consequent unequal action of the fire, will not be so quickly destroyed. The second improvement relates to the purifying and condensing of gas in a vacuum. This improvement is applied after the gas has passed the hydraulic main, and has, consequently, deposited its coal tar and ammonaical liquor in the ordinary way. It should be observed, that the ordinary mode of cooling, condensing, and purifying gas, is, by causing it to traverse a succession of vessels or pipes, varying in length to upwards of 1500 feet, which are sometimes exposed to the atmosphere, and sometimes placed under ground, but more frequently surrounded by water, from thence the gas passes through, and is washed by water, and is also passed through beds or layers of lime, in the common lime vessels, or purifyers, which causes considerable strain or pressure to the retorts, and other parts of the apparatus. The object of the improvement in this part of the apparatus is to carry on the process of gas making, without causing such pressure to the apparatus, the gas is permitted to flow freely through the hydraulic main to the gasometer, and, at the same time, is brought into immediate contact with water in the form of showers, streams, or jets; and as ammonia and water have a great affinity for each other, the ammonia will be taken up by the water; and if there be an admixture of lime, the sulphur will also be separated from the gas. The apparatus for effecting this part of the invention consists of a vessel, having a succession of shelves, which are perforated with holes, down and through which the water runs in streams; and the shelves being placed alternately, from side to side, and sloping downwards, the water is con-

tinually changing its course, as it flows downwards, and the gas being admitted at the lowest parts rises in an opposite direction, is constantly acted on by the water, and is thus condensed and purified. There are also perforated shelves containing lime, through which the gas passes, the more perfectly to accomplish the purification. This second improvement is said to be greatly facilitated by the action of the third,—that of a means of producing a vacuum to the parts described; and this consists in attaching a pipe from the upper part of the last described vessel to an apparatus somewhat similar to a Savary's steam engine. The first cylinder is to be full of water, which is forced from this cylinder into the second cylinder, by the pressure of steam, and when the first cylinder becomes full of steam, and the other full of water, the steam cock is closed, and the gas cock from the purifier and condenser last described, and which is connected to the second cylinder, is opened by this means, as the steam becomes condensed in the first cylinder, the water flows back, and the gas fills the space left by the water in the second cylinder; the steam cock is then again opened, which drives the water from the first into the second cylinder, and thus the gas is driven forward out of the second cylinder to the gasometer, and this action is constantly kept up during the production of gas.

The patentees claim the three improvements above mentioned; that is, the heating rollers (in the distillation of gas from coal or other material) by placing them in contact with, and surrounded by, the fuel, without the aid of a high chimney or other means of obtaining a violent draft; also the means of purifying gas; and the means of aiding the operation by an apparatus for producing a vacuum, thereby avoiding the pressure otherwise consequent on the retorts and other parts of the apparatus when used in the ordinary manner.

[*Rep. Pat. Inv.*

To JACOB PERKINS, *Engineer, for an improvement in Preserving Copper, in certain cases, from the oxidation caused by heat. Sealed November* 20, 1832.

The invention relates to the preservation of the copper tubes used in steam boilers, particularly such as are now employed on the Liverpool and Manchester rail-roads; in which boilers, the flues from the fire-box, or furnace, consist of a number of small copper tubes, through which the heat, fumes, and vapours, pass to the chimney, and it has been found that these tubes become quickly destroyed by oxidation. The patentee states that his improvement consists in coating the parts of such copper tubes directly acted on by the heat with an alloy, or mixture of copper and zinc, by which means such copper tubes will be greatly preserved from the effects of oxidation produced by heat; and he then describes the means which he uses for coating such tubes, either on the outer or the inner sides; and although he has particularly mentioned the tubes used in boilers similar to those employed on the Manchester and Liverpool rail-roads, which have their

inner surfaces exposed to the action of the heat and vapours arising from the furnace, yet the same effect will be produced in coating tubes on their outer surfaces, when they are used in boilers which have the water on the inside, and the fire acting on the outer surfaces. He mixes about two-thirds of copper with one-third of zinc, by melting, (these being the proportions he prefers;) but he does not confine himself thereto, as the same may be varied.

With this mixture he coats the surfaces which are to be directly acted on by the heat and vapours, by bringing the surfaces, whether the exterior or interior surface, so to be coated, in contact with a quantity of the melted alloy aforesaid, and keeping them in contact till the melted metals or alloy adhere all over those surfaces of the copper tubes which are to be directly acted on by the heat; or this coating may be effected in a similar manner as is practiced in joining the two edges of the copper in making the copper tubes, taking especial care that there is a thin coating over every part of that surface of the tube which is to be directly acted on by the heat.

The patentee states, that he claims as his invention, the coating copper tubes in steam boilers with a mixture, or an alloy, of copper and zinc, as above described, and thus greatly preserving them from oxidation caused by heat. *Lond. Jour.*

¶ List of French Patents.

A List of Patents for Inventions, Improvements, and the introduction of Foreign Inventions or Improvements, granted in France during the first quarter of the year 1832.*

[TRANSLATED FOR THIS JOURNAL.]

(Continued from p. 199.)

Madame Gerin, (Widow,) Son & Co., merchants, St. Stephens, Department of Loire, February 22nd, 1832, (10 years,) a new species of fire arms. (P. Invent.)

John Goff, of London, represented at Paris by M. de Moleon, March 26th, 1832, (10 years,) an improved apparatus for filtering water. (P. Invent. and Improv.)

Peter Hugues, lawyer, Bordeaux, department of Gironde, February 20th, 1832, (5 years.) A machine for sowing grain, called "the Hugues' Sower." (P. Invent.)

John Francis Hulot, Paris, March 9th, 1832. An eatable, called Racahout, made from the palamont of Turkey, which corresponds to our acorn. (P. Improv.)

Abraham Emanuel Jaccond, mechanician of Vienna, residing

* In the following list P. Invent. denotes a patent for an invention. P. Invent. and Improv. a patent for invention and improvement. P. Improv. a patent for an improvement. P. Import. a patent for the importation, or introduction of a foreign invention. P. Import. Improv. a patent for introduction and improvement. P. Invent. Import. a patent for invention and importation.

with M. Bert, merchant, Lyons, department of the Rhone, February 11th, 1832, (10 years.) Method of making wheel-stocks, axles, sockets, pins, &c. applicable to all kinds of wheels, having the advantage of containing within each the oil required to lubricate it. (P. Improv.)

Amable Jay, hatmaker, Paris, January 14th, 1832, (5 years.) The use of caoutchouc in the manufacture of hats. (P. Invent and Improv.)

John Lachaise, senr., merchant taylor, at Grandis, district of Villa Franca, department of the Rhone, January 23d, 1832, (5 years.) A process for cutting coats. (P. Invent.)

De Lancry and Charry, Paris, February 20th, 1832, (5 years.) A musket or fowling piece firing twice from the same barrel, and with but one vent or touch-hole. (P. Improv.)

Felix Leaubereau, merchant, Paris, February 20th, 1832, (15 years.) A manometric lamp, with a double wick and draught, and two receivers. (P. Improv.)

Charles B. Lehody, watchmaker, Paris, March 9th, 1832, (5 years.) Improvement in the manufacture of pendulums. (P. Invent.)

Alexander Edward Lemolt, magistrate, Paris, March 28th, 1832, (10 years.) Therapeutic method of electrical friction, and the requisite apparatus, called the electrical brush. (P. Invent. and Improv.)

G. and I. Louvet, of Peronne, residing in Paris, January 31st, 1832, (10 years.) An improved apparatus for boiling beet juice. (P. Improv.)

Philip Maihieu, Gent., Lyons, department of the Rhone. A new percussion gun and pistol. (P. Invent. Improv.)

George Louis May, Paris, January 27th, 1832, (10 years.) Method of making strong beer by steam process. (P. Invent.)

Mention and Wagner, jewellers, represented in Paris by M. Traffaut, March 14th, 1832, (5 years.) Process for making black enamel, for printing the designs engraved upon plates of all dimensions, and for applying enamel to certain metals. (P. Improv.)

Stephen G. Merckel, Paris, February 11th and 28th March, 1832, (15 years.) *Phlogosaide* matches. (P. Invent.)

F. Meugnot de Nansouty, represented by Madame de Nausouty, Dijon (Cote d'Or,) March 26th, 1832, (5 years.) Method of manufacturing plough shares of rolled iron. (P. Invent.)

F. M. Mignard Billinge, machine maker, Belleville, near Paris, February 11, 1832, (10 years.) A machine for opening oysters. (P. Invent.)

Toussaint L. J. Milan, senr., tin-lamp maker, Paris, March 7th, 1832, (15 years.) Several fixtures to facilitate and simplify the use of hanging lamps. (P. Invent.)

Andrew Millet, constructor of fireplaces, Paris, January 9th, and 26th March, 1832, (10 years.) Portable metal fixtures for fireplaces, by means of which the fire is brought out from the chimney. (P. Improv.)

Thomas M. Motte-Falisse, watchmaker, Paris, March 9th, 1832. New system of percussion applicable to fire arms. (P. Import.)

Nereé-Tellier, goldsmith, Paris, March 28th, 1832, (10 years.) New carriage, with *Tellier* springs. (P. Improv.)

Peter Olagnon, machine maker, St. Stephens, department of the Loire, March 26th, 1832, (5 years.) Loom for the manufacture of ribbon or other articles of any size. (P. Invent. Improv.)

Madame Payene, manufacturer, Sedan, department of Ardennes, March 31st, 1832, (5 years.) A water for bleaching linen, called "blue of roses." (P. Invent.)

John P. Pernot, represented at Paris by M. Lambert, Royal Conservatory of Arts and Manufactures, January 23d, 1832, (5 years.) Articles of straw of different colours glued upon stuffs and intended to make hats, to replace hangings, and which may be combined so as to form designs upon wood. (P. Invent.)

Bartholomew Perrin, Paris. A simple apparatus, which he calls *autopiese*, for uniting and separating instantaneously several small objects, and of changing or continuing their direction. (P. Invent.)

Charles Phillippe, of Brussels, represented at Paris by Eugene Phillippe, February 20th, 1832, (10 years.) A machine for making pins. (P. Invent. and Improv.)

Peter Andrew Piquenot, ribbon and suspender manufacturer, Paris, March 26th, 1832. For the manufacture of net-work suspenders, with button holes without stitching. (P. Invent. and Improv.)

Stephen Plantvignes, merchant, Bordeaux, department of Gironde. For a *Marine Rail-way* for hauling up vessels, and for overcoming lifts, by the use of metallic balls, of rollers, and of iron wheels and axles. (P. Invent. Improv.)

Louis Basilde Sulpicius Poissant, and Besnier Duchaussais, resident at Courcelles-les-Mezerolles, department of Somme, January 26th, and March 28th, 1832, (each 10 years.) New and economical process for kneading and baking bread. (P. Invent and P. Improv.)

Philip Querini, merchant, Paris, January 9th, 1832, (5 years.) Mode of manufacturing paste-board and paper of straw, and of whitening the same. (P. Invent. Import. Improv.)

John Anthony Raymond, merchant, Paris, February 14th, 1832, (15 years.) A metallic tongue, to be used with or without glue, and proof against moisture, for joining different articles. (P. Improv.)

Constantine Lewis Rolland de Blomac, Carcassone, department of Aude, March 28, 1832, (15 years.) Method of increasing tenfold the value of the marc of grapes. (P. Invent.)

Rollé and Schwilgué, mechanists of Strasburg, Lower Rhine, January 26th, 1832, (10 years.) Hydraulic weighing machine, for weighing loaded carriages. (P. Improv.)

Rollé and Schwilgué, mechanists of Strasburg, January 31st, 1832, (10 years.) Household weighing machine. (P. Invent.)

Peter Isidore Rouen, Paris, February 29th, 1832, (10 years.) Hydraulic regulator of the flow and action of liquids and gases. (P. Improv.)

Louis Roussel, manufacturer of domestic sugar, Lespine, arron-

disment of Avesne, January 23rd, 1832, (5 years,) and 26th March, 1832, (5 years.) Mode of extracting the last portion of sugar from the beet. (P. Invent. and Improv.)

Louis Joseph Salmon, manufacturer, Paris, January 27th, 1832, (15 years.) New manure. (P. Invent.)

Claude Francis Sigonney, shoemaker, Paris, March 28th, 1832, (5 years.) Economical stove for cooking, and heating apartments. (P. Invent.)

John Marie Souchon, chemist, Paris, March 28th, 1832, (15 years.) Method of dyeing with prussian blue and other substances. (P. Invent. Improv.)

Maurice Louis Steinau, of Berlin, residing at Paris, January 24th, 1832, (15 years.) New manure. (P. Invent.)

Augustus William Tampier, Bordeaux, department of Gironde, March 14th, 1832, (5 years.) *French* system of penmanship. (P. Invent. Improv.)

Thilorier and Serrurot, Paris, March 9th, 1832, (15 years.) Hydrostatic lamp with an interior reservoir, to be used instead of the *Carcel* lamp, and having no wheel work connected with it. (P. Improv.)

Andrew Stephen Trompette, Paris, January 27th, 1832, (10 years.) New method of hanging carriage bodies. (P. Improv.)

Tschaffen and de Kees, Vienna, represented at Paris by M. Risler, January 27th, 1832, (5 years.) Machine called a turning press, for making plates, or other articles of the same sort of silver, tin, copper, &c. (P. Import.)

George Hippolyte Viel, watchmaker, Paris, February 21st, 1832, (5 years.) Improvement in mantel time pieces. (P. Invent. Improv.)

John Marie Vouret, mechanist, of Louviers, residing at Paris, January 23d, 1832, (10 years.) Machine for ploughing and harrowing. (P. Invent.)

Recapitulation.—During the 1st quarter of 1832, there have been issued, in France, ninety patents.

¶ *On the application of Steam, expansively, in Cornish Steam Engines.*

By E. Galloway, Esq., Civil Engineer.

[Continued from p. 277.]

It was not till 1804 that high steam was used expansively. In that year Mr. Arthur Wolf obtained a patent for an alleged property possessed by steam. He assumed that steam of a force equal to any number of pounds above atmospheric pressure, would expand itself the same number of times its volume; and, supposing no waste of caloric by radiation, would still retain an elastic force equal to that of the atmosphere. He states that he had proved by experiment, that steam of forty pounds on the square inch, would expand itself to forty

times its volume, and yet equal the elastic force of the atmosphere.* There is, however now no law which is better understood than that of the expansion of elastic fluids; and it is certain, that if no change of temperature take place, the space occupied is inversely as the pressure. It would have been singular if the ratio of expansion had commenced at the temperature at which the steam balances the pressure of our atmosphere, which pressure is variable, not only from the changes of weather, but with the altitude. Mr. Wolf was not aware that fluids obey the same laws, and are not dependant on each other for the ratios of their expansion. Water commences to expand itself into steam at a certain temperature, and above that temperature its ratio of expansion is regular. The atmospheric pressure is a deduction from its effect, because it acts as a counterbalance: if removed, or, which is the same thing, if the steam be allowed to expand in vacuo, it is evident it must obey the common laws of expansion to which fluids are subject: hence it commences to expand not at 212 degrees, as Wolf supposes, but at 40 degrees. Steam of forty pounds is really equal to more than fifty-four pounds; that is, the atmospheric column $\times 40 =$ to about 54; and this, instead of expanding itself forty times, cannot expand itself four times without being reduced below atmospheric pressure.

The expansive property of steam is strictly mechanical and common to all fluids. It simply consists in this, that vapour, of a given elastic force, will expand itself to certain limits; and during the process of expansion, will act on opposing bodies with a force gradually decreasing until it has reached the limits of its expansive force, or is counterbalanced by the resistance of a surrounding medium. If air, for example, be compressed in a close vessel, and suffered to act on a piston, it will give motion to the piston with a decreasing effort, until (supposing the absence of friction) the air in the vessel be in equilibrio with the surrounding atmosphere. In like manner, steam of high elastic force, being permitted to actuate a piston during a portion of its stroke in a cylinder, and afterwards the communication which admitted it being closed, will expand itself until counterbalanced by the atmosphere. But, if a partial vacuum be formed on the other side of the piston, its motion will then be continued until its density be as low as that of the uncondensed vapour on the opposite side of the piston. It is clear that the power which may be obtained by thus impelling a piston, is as the mean between the highest and lowest pressure on the piston.

* Mr. Tilloch tried the experiments in conjunction with Mr. Wolf, by which the latter was led to conclude, that the expansive power of steam was in the ratio of its density in pounds *above the atmospheric pressure.* They used in the experiments two vessels, whose capacity were proportionate to the anticipated expansive power, and found that an elevated column of mercury was restored to equilibrium when the steam was admitted into the larger vessel. This experiment, however, is evidently imperfect, since equilibrium might have been restored by leakage, or other causes. The expanded steam should have been made to *sustain* a column of mercury before any result to be relied on could be obtained.

It will be well understood, that it is saving, and not gain, that thus results: a power being made use of which was before lost. For, referring to the example of compressed air, it is true that, if the air be condensed so as to equal twenty pounds on the square inch, and the supply be continued throughout the stroke, an impulse could be given to a piston equal to twenty pounds per square inch, during its whole stroke; whilst, if it be cut off at a portion of the stroke, and allowed to expand itself, the impulse would be only as the mean = 10 lbs.; but it is evident that, in the former case, we suffer the air to escape from the cylinder at the same elasticity as it entered, and lose the whole of the force which was necessary to compress it to its density; while by expanding it to its limits, we lose no part of that force.

The main-spring of a watch actuates its machinery in this manner: an increasing effort is required to wind up the spring, and a decreasing impulse is given back to the machinery. This is so regulated, however, by the fusee on which it acts, as to give a regular motion. Now, if after the spring had partially uncoiled itself, it were then liberated, and allowed to do so completely, the force which wound it up to its last impelling point would be totally lost.

So in the steam engine, a certain quantity of fuel is required to raise steam to a certain elasticity; if, then, the steam be allowed (after moving the piston) to escape into the atmosphere without having acted expansively, the fuel which was consumed to raise it up to that elasticity, will have been principally lost. In the one case, a given bulk of fuel would produce forty, in the other, would produce 0; that is, 40, + 39, + 38, +37, &c. &c.

It is easy to see by this, that the advantages arising from expansion, increase with the density of the steam; for steam of 50 lbs. per square inch above the atmosphere being = 64, and steam of 10 lbs. above the atmosphere being = 24; we have in the one case a mean effect of twelve acting through twenty-four of space; and on the other a mean of thirty-two acting through sixty-four of space, whilst the fuel consumed is nearly as the respective densities of the steam; ergo, steam of 50 = 64 lbs. gives a mean pressure of 32, expanding to 64 times the original bulk, before it reaches the limits of its expansive power; hence $32 \times 64 = 2048$. But steam of 10 = 24 lbs. gives a mean pressure of 12, expanding 24 times its original bulk before it reaches the limits of its expansive power; hence $12 \times 24 = 288$. In round numbers 64 of steam performs more than seven times the duty of 24 of steam; being in favour of the higher steam nearly as 3 : 1.

It is not difficult to ascertain the extent of saving over the Boulton & Watt engines, effected at Wheal Towan, when the law of expansion is perfectly understood. The pressure of steam in the boiler is regulated to 35 lbs. on the square inch; but this, by wire drawing in the passages, is reduced in the cylinder to about 27 lbs. above the atmospheric pressure=41 lbs. which, cut off at one-fourth of the stroke, will expand itself to five pounds above vacuum, and give a mean impelling effort to the piston of 23¼ lbs. Steam of six lbs. on the inch, is, by wire drawing on the passages, generally reduced from one to four pounds on the inch: taking 2 lbs. + 14, as an average of the

effective pressure in the Boulton & Watt engines admitted during the whole stroke, we obtain an impelling effort of 16 lbs.

The fuel consumed being supposed in the ratio of the pressure of the steam above a vacuum, we obtain the following results:

49 of steam × 25 parts of the stroke = 12 performs a duty of $23\frac{1}{2}$
20 of steam × 1 „ „ = 20 „ „ 16

the advantage being in favour of the high steam as 38 : 16.

The result in practice falls short of this in both cases, from leakage and other causes, but as these are common to both systems, I have made no deductions from either.

4th. *Covering, or "clothing," the boiler, steam pipes, steam chests, and cylinder, with a nonconducting substance, to prevent the radiation of heat.*

This, in many of the Cornish engines, is so effectually done, that the heat in the engine room does not materially affect the thermometer. The radiation from the boiler is also, in many cases, scarcely perceptible. The merit of using clothing so effectually, and indeed its first application with any useful result, is due to Capt. Samuel Grose, on whose plans the engines at Wheal Towan are constructed, whose elegant arrangements of machinery, and accuracy of proportions, have enabled him to outstrip all his competitors. Since the year 1825, the period at which he erected his first engine, his improvements have increased the duty of a bushel of coals on the average, throughout the country, forty per cent., and in individual cases, more than two hundred per cent.

The value of the advantages of clothing is variously estimated, nor am I aware that any experiments have been made of sufficient extent and accuracy to be relied on. Mr. R. W. Fox, of Falmouth, tried some experiments, and found that a slight covering of paint over his steam vessel, effected a saving of one-fifth. Mr. Grose's method of clothing, however, may be said to be as perfect as is attainable, and its application at Wheal Hope, without any other material alteration, increased the duty of one bushel of coals from 40 to 70 millions. Of this fact I have been assured by various disinterested parties, although it is asserted by other engineers that the advantage of clothing does not exceed an increase in the duty of one-fifth or one-fourth. I am, however, convinced that the improvement at Wheal Hope is always attainable where the clothing is effectively applied.

5th. *Suspending the action of the piston at the completion of the stroke, to allow time for the perfect condensation of the steam in the cylinder.*

The increase of effect produced by this improvement is considerable, as the superior efficiency of engines for drawing water is dependant upon their power being greatest at the commencement of the lifting stroke, where more power is necessary to overcome the vis inertiæ of the matter raised, than to continue its motion. I have found that the best engines on the Boulton & Watt principle, make about one-fourth of a stroke before condensation is completed; and assuming that in the Wheal Towan engine the same time would be required, the mean decrease of effect would be 7 lbs. × 25 parts of the

stroke, which, being deducted from 23½ lbs. (the mean pressure on the piston during the whole stroke,) would amount to a loss of nearly one-tenth of the whole effect.

From the preceding investigation we shall be able to ascertain, tolerably nearly, the increase of duty assignable to each of the Cornish improvements.

Boulton & Watt's engines perform an average duty of raising 19,800,000 lbs. one foot high, with one bushel of coal.

As in the Wheal Towan boilers, one bushel of coal converts 13.824 cubic feet of water into steam, at atmospheric pressure, while the Boulton & Watt engine boiler rarely converts more than eight cubic feet into steam of similar elasticity, we have an increase of duty from the boiler alone as 13.824 : 8, which on 19.800.000 is equivalent to a duty of raising one foot high . . 34.214.400 lbs.

Increase of duty by using steam of 35 lbs. in the boiler, equal to 27 lbs. in the cylinder + 14 lbs. pressure above vacuum × .25 parts of the stroke = 12.25 composed of steam of six lbs. in the boiler, equal to two lbs. in the cylinder + 14 lbs. pressure above vacuum × the whole stroke = 20; 12.25 producing a mean pressure of 23½ lbs.; and 20 a pressure of only 16 lbs., which gives an increase on 34.214.400 = . . . 47.044.800

Increase of duty by the application of clothing, three-sevenths of the whole duty of 81.259.200 lbs. 34.125.371

Increase of duty by obtaining a more perfect vacuum at the commencement of the lifting stroke, by suspending the motion of the piston until the steam is condensed, equal to one-tenth of the whole duty, 11.608.457

Total duty of one bushel of coal, . 127.693.028

I am aware that more accurate experiments may detect errors in the proportion of duty I have assigned to each of these improvements; respecting the real amount of duty, and the cause of the increase, however, there can be no doubt, nor do I anticipate that my proportions will greatly vary from the truth. I have, as I said before, made no allowances for losses by leakage, or imperfect vacuum, which, being common to both, would most affect the lesser performance. I am anxious not to overrate the advantages, and have not, therefore, included the saving of fuel stated by M. Clement to be obtained simply by the generation of higher steam, as the consumption of fuel does not, he states, increase in the ratio of the elasticity. The accuracy of his experiments are, however, doubted by others, and I have therefore rejected them.

[*Rep. Pat. Inv.*

¶ *Report of Messrs. Walker and Burges, Civil Engineers, on the state of Blackfriars Bridge.*

(Concluded from page 286.)

Alteration in Level of Cutwater.—We propose that the finish of the cutwater, which forms the foundation on which the columns stand, should be raised two feet eight inches, the present low level having been the cause of the decay near the bases, which we have referred to; this will be the more necessary when the addition to the rise of the tides is considered. The columns, we have no doubt, originally stood level with the high water of spring tides, and they are so shown on the engraved elevations; but the standard of ordinary spring tides, as fixed by the Trinity House in 1800, is ten inches on the average above the foot of the columns, so that, the London Bridge dam being removed, the bases are now generally covered with water at spring tides. We think that the alteration will improve the appearance of the columns; and as this is the only point of consequence in which we have interfered with the architecture of the bridge, (having studiously avoided doing so,) we have had one drawing prepared with the columns as they now are, and another showing the proposed alteration, and by them we are confirmed in this opinion. We recommend shortening the columns without lessening their diameters: their present height is in no case less than ten diameters, which is greater by one diameter than the height usually assigned to the Ionic order. If there is any case in which a deviation from strict rule, so as to give the appearance of greater strength, is allowable, it is in bridge architecture; but, fortunately, we do not require to use any license on the present occasion.

Architraves and Balustrade.—The architraves over the columns are also proposed to be renewed. The balustrade, or parapet, requires to be noticed more particularly: it is at present in a very dilapidated condition, a great number of the balustrades being broken or otherwise injured, and the capping in a very bad state. Having paid great attention to this point, we do not see any way so effectually, and, on the whole, so economical, as having new balusters for the lower or east side of the bridge, and transferring the soundest of the present ones to make good the deficiency on the west side. New capping of good stone is proposed for both sides, and as the base on which the balusters stand must be repaired and reworked, we propose to reduce its height about three inches, which will take off the defective parts of the stone, and make the balustrade of a better level as respects the view of the river than it now is.

Arch Stones.—The broken and defective arch stones, which have been measured one by one, are all to be taken out, and replaced with new; the whole of the facing and soffits of the arches thoroughly cleaned, the joints pointed with pozzolano mortar, and generally, in addition to what has been stated, every part of the bridge is to be thoroughly repaired, as is particularly described in the specification.

Lowering Causeways.—We have included, also, the lowering of

the causeway on both sides of the river, and the ground under three of the arches on the city side, and one arch on the Surry side. The increase which will thus be given to the water way will be an improvement, and the cost trifling, as the material is proper for ballast.

Foot Paving.—The foot paving of the east side is proposed to be of new granite; that of the west to be made good with the best of the present stone taken from both sides.

Stairs.—The steps of the watermen's stairs are all to be of new granite; a few of the steps are at present granite, which will do to be used again near the bottom.

Estimate—The estimate of all the works contained in the specification amounts to the sum of £58.305, which includes an allowance of fifteen per cent. for contingent expenses and superintendence.

Change of Bed of River.—On comparing the bed of the river, as shown by the engraved elevation, with the present levels, a great difference is observable, particularly on the city side. The low water mark, which appears to have reached the middle of the first arch on this side, does not now go much beyond the middle of the third arch. Round the second pier, there is shown a depth of eight feet at low water: it is now dry, and there is nearly the same difference in the level of the ground round the first pier. The variation is less towards the middle of the river, and on the Surry side there is not much change; if any, the depth appears to have increased. But the most important difference, as affecting the stability of the piers, is near their *shoulders*, compared with the present depths in the line of the *middle*, particularly of the four piers on the south of the fourth arch, from the city side. There is little doubt of the ground having been left at least as high at the ends and shoulders of the piers as in the middle. Beginning at the fourth pier from the city side, or the Middlesex pier of the centre arch, the ground towards the middle of the pier, is six feet above the tops of the bearing piles, or bottom of the caisson. Near the upper, or west, end of the same pier it is generally only two feet above the piles, and for six feet in width it is actually below the tops of the piles, and has washed from under the bottom to a depth of eighteen inches; so that a boat hook could be thrust five feet under the caisson bottom, of which this angle is therefore entirely unsupported, except by one or two bearing piles. Near the lower or east end of the same pier, it is, on the average, only two feet above the piles, or level with the top of the timber platforms. The levels and differences of the Surry pier of the centre arch are similar to the one we have described. At the sixth pier from the Middlesex. or third from the Surry side, the ground is from two to four feet lower towards the ends than at the middle; the average level towards the ends being only one foot above the piles at the west end, and from two feet to two feet six inches at the lower end. At the ends of the second pier from the Surry side the ground is from two to two feet six inches lower than in the middle, and only one foot to eighteen inches above the bearing piles.

Effects of Removal of London Bridge.—We had no information to guide us as to the section of the ground previously to the removal of

London Bridge; but there is little doubt that the additional scour thereby caused has been the principal, if not the only, cause of the deepening at the piers. As we consider that the bridge would not be secure if an increase of scour were to remove more of the ground from the foundations, we explained the facts and our opinion to the chairman of the committee, who considered that it would be desirable to have a survey and report on the probable effect which the entire removal of the dam formed by the piers of the old bridge would produce on Blackfriars Bridge, and the means we should advise to secure the foundations completely, with reference to such removal. We have, therefore, bored the bed of the river near the site of the piers, in order to ascertain the level of the clay; because if the caisson bottoms had been founded upon the bed of London clay, the danger of undermining would have been much less. The result has proved that the caissons do not rest on the clay, but that in the piers where clay has been found, a stratum of gravel, varying from eighteen inches to four feet, is interposed between it and the bottoms.

Shoot through London Bridge.—We have also made a series of observations on the fall, or shoot, at old London Bridge, with a view to ascertain its present extent, compared with what it was before any part of the obstruction was removed, that we might thereby form a judgment if the scour through Blackfriars Bridge is likely to be increased. The average of our observations gives a fall from Old Swan Stairs to Billingsgate of two feet four inches at the low water of spring tides. On reference to the table of tides, taken under the direction of Mr. James Montague, in 1820 and 1823, we find that a fall of a similar tide was four feet four inches. The difference, therefore, is already lessened two feet; but we think that the entire removal of the old bridge, and the shoals near it, will reduce the present shoot of twenty-eight inches to four inches; or, in other words, that the water above the bridge, already fallen two feet, will fall two feet more, and that the velocity and scour through Blackfriars Bridge will be much increased. The direct effect of this will be still more to undermine the bridge, unless effectual means be taken to prevent it; and it would, in our opinion, be imprudent to expend a large sum in the repair of the superstructure without properly securing the foundations so as to be prepared for the circumstances we have stated.

Securing Foundations.—The plan we would propose for this purpose is to drive a complete row of close piles, twelve inches thick and thirteen feet long, with guide piles, and walls round five of the piers, the heads being level with the top of the caisson bottoms, and to build up the spaces between the piles and the piers solidly with stone laid to a proper slope. In whatever way this is executed, the operation will be tedious and expensive; but when properly done, the work will be secure against almost any contingency. One of the modes which may be adopted is that used at Westminster Bridge, which is to drive the piles in the water, and afterwards cut off the heads to the proper level in the diving bell, and to do the masonry also by the bell. We have prepared an estimate of this, and make the expenses £23966, including contingencies, &c., as before, which, with the sum already

stated for the other repairs, makes a total amount of £82,271. But the most effectual plan is undoubtedly by means of coffre-dams, as they will, at the same time, give an opportunity of examining every part of the foundation, and enable the stone work between high and low water to be done in the dry, which is both better and cheaper than in the tide. The amount of dams and piling for the five piers, allowing a deduction for the difference of labour in the masonry, is £30,625, making, with the general repairs, a total of £88,930.

Estimates.—The worst features of the above are probably the large amounts of the estimated repairs; but to do the works properly, they are, we believe, unavoidable. The quantities are all from detailed measurements, and the prices from considerable experience in works and estimates of this nature. There is one exception as to the certainty of accuracy, and that is the cost of the work done in the diving bell, to which so many contingencies are attached that it cannot, either as to time or expense, be estimated with correctness. We have in this case taken the prices of work done within coffre dams as a basis, and added to them for the risk and difficulty of the work done by the diving bell.

Time.—Our opinion is, that the repairs from low water upwards, which are stated in the first part of this report, may be completed in from two and a half to three years, and that if the coffre dam plan be adopted, the works of the foundations and superstructure may both be done in three years; but if the diving bell be used, the time is, we have said, very uncertain.

Necessity of immediate measures of security.—We have stated that no time should be lost in defending the bridge against accident, and when the present unprotected condition of part of the foundations, arising from the changes at London Bridge, is considered, there can be little doubt of the necessity of making the securing of the foundations keep pace with, or rather precede, the further removal of the dam formed by the remaining piers for the old bridge, and the shoal under it. On inquiry, we learn that the latter work is to be completed in the course of the present year;* to place Blackfriars Bridge out of danger, two, at least, of the piers ought to be secured, if possible, during the same time.

Abstract.—Our opinion on the important points referred to in this report may therefore be summed up in the following abstract:—

	£	*s*	*d*
The cost of the repairs above low water, will amount, in round numbers, to . . .	60,000	0	0
The piling, and otherwise securing the foundatians; done in coffre dams, to . .	30,000	0	0
Making together . . .	90,000	0	0

But, whether as respects the security of the superstructure, or the foundations, or the safety of passengers under and over the bridge,

* The Chairman of the London Bridge Committee informs us six months.

the work of repairing either ought by no means to be delayed; no prudent man would, we think, like to take on him the responsibility of the bridge in its present state for any time.

JAS. WALKER,
A. BURGES.

The substance of a Lecture on the practical prevention of Dry Rot in Timber; delivered by Prof. FARADAY, *at the Royal Institution of Great Britain, February* 22, 1833.

Professor Faraday commenced by repeating a remark, that what was most elaborate in nature, was that which soonest runs to decay. It fell to his lot to bring before the members of the Royal Institution one of those instances of decay, in which nature seemed to have deprived mankind of the benefits which she at first appeared disposed to promise, by shortening the duration of its enjoyment. But, in bringing forward the prevention of dry rot, he had no right to claim it as *his* subject, it being dependant on a process invented by Mr. Kyan, or, in stricter terms, improved by him; and he begged to say the meeting was indebted to the exertions and liberality of some of its members for the various illustrations before them.

With regard to decay in general, and to that of wood in particular, which gives rise to the destruction now to be guarded against, it was hardly possible to say any thing definite as to the cause of that decay, for it seemed to him that cause and effect almost replaced each other; that is, what was a consequence at one time, was at other times a cause of the final ruin of those fibrous matters which are used for domestic purposes. On reference to the different specimens around him, instances would be seen of rapid and extensive decay, which it is the object of the process he had to bring before them to prevent. For instance, said Prof. F., here is exhibited a beam of wood, in which the one part is rapidly passing to decay, and the other part is sound, or nearly so. There is a piece of wood on the table, made into a thin plank, and laid over the internal wood-work. It has been painted outside, and appeared to the eye to be good, but, after a short time, the rot caused it to decay; the rot had run from the interior to within the twentieth part of an inch of the paint, which, aided by the air and light, had stopped its progress. Prof. Faraday showed another specimen, which had been sent to him by Prof. Burnett, of the results of the same kind of decay, or what is called the dry rot fungus. It was the most magnificent he had ever seen, and was formed in a sort of gutter or wooden trough across a large room, the conservatory of his Grace the Duke of Norfolk. The fungus had prospered so much, that even its fructification was fully developed. Those who might wish to examine it closely, would see that the plant was extending itself from place to place, and producing here and there aggregations of seed vessels consistent with its organic arrangements. Another specimen, was a case of decay from animal operations, which had been going on at Woolwich; it was taken from a large mass of timber, so

penetrated by the worm, that it appeared to be like a piece of sponge. There was another piece similarly circumstanced, which had been a part of one of the timbers belonging to Brighton Pier. It, in the first instance, had been fifteen inches square, before being placed under water; and it was wonderful to observe how, by decay and the action of various insects, it had been brought to its present state. Another specimen was part of a mast of a vessel, which, though to appearance sound on the outside, was in the inside gone as if it had been hollowed out by a workman's tool; the decay had taken away the strength of the mast.

Wishing to obtain a clear notion of the subject, he, Professor Faraday, went a short time before to Woolwich, to ascertain what was proceeding under the sanction, or by order of, the Admiralty. He took an opportunity of going on board a frigate, the Thalia, to see the state of the timber that had been used in the construction of a vessel that was intended to hold hundreds of men. Reference might be made to one or two cases of decay on record with regard to such vessels, and the facts appear most extraordinary when we are led to consider what an enormous expense had been incurred from that cause. He understood, (and all that knowledge which was not purely chemical, he had obtained from others,) that, in the construction of vessels in the navy, the proportion of wood consumed was about as follows:—A first-rate, carrying ninety guns or upwards, consumed in her construction 5,880 loads of timber; a second rate, or eighty-gun ship, of which a model as regards the hull was on the table, consumed 4,339 loads; a third rate, or seventy-gun ship, consumed 3,600; a fourth rate, 2,372; a fifth rate, 1,800; a sixth rate, or twenty-eight-gun ship, 963 loads. Now, when they heard such statements as he would read from the Quarterly Review, for 1813, it would give those who have not attended to the subject, some idea of the importance of the present inquiry. The Rodney was launched in 1809; she had scarcely put to sea, when, owing to the unseasoned state of her timber, all her fastenings became loose, and it was necessary to bring her home from the Mediterranean in 1812, to be paid off. The next example was a very serious one; it was that of the Dublin. That ship was launched in February, 1812, put into commission in the following August, sent upon a cruise towards Madeira and the Western Islands in December, from which she returned to Plymouth, in 1813, in so dreadful a state that she was ordered to be paid off. She has since been repaired at an expense not much less, it is stated, than £20,000. Cases could be mentioned of ships in private dockyards, which had scarcely been at sea before they were knocked up and sold as wood for fuel or other purposes, in consequence of the dry rot having taken possession of them; and it could even be shown that quantities of timber which had been stacked up for seasoning, a process occupying from two or three, to four or five years, had actually gone to decay, while they were in seasoning, before they had been brought into use.

Circumstances like these have induced various persons to search for different remedies for the dry rot, and many processes have been

devised. Government has from time to time been pestered, it may be said, by different inventors who have failed to obtain the end in a desirable and perfect manner. Prof. Faraday said it was not his object to take into review those various processes; he had always considered that a process intended to be applied in a large way for useful purposes must be tried before an opinion was given on it. The importance of the subject was such, that government have always paid that fair attention to such applications as would induce them to try the remedies proposed, if they came justified by sufficient evidence to deserve the tribute of praise, upon which the trials were called for. He might dispose of all these, because, having been tried fairly, and having failed, it was presumed the trials had not led to any final application. He should take up only that one which he had considered (as far as its chemical principles were concerned, and as far as it was connected with the case,) and thought *to be borne out by the previous knowledge of the substance used, as being sufficient for the purpose proposed; requiring only to be tried to justify the full assurance of its use.* The process he had to lay before them depended upon the application of an anti-destructive, which had been long known as a very active body in all such cases, namely, corrosive sublimate; for every anatomist, and every visiter of an anatomical museum knows that corrosive sublimate was, and is, used from time to time to prevent the decay of the most delicate organic tissues and parts, even such things as the brain itself, which are liable to putrescence; and by the application of this metallic preparation, they can be prevented from going to decay, and be preserved for any length of time.

A gentleman of the name of Kyan, considering the property of corrosive sublimate, proposed to apply it to timber for the prevention of the dry rot; that is, in cases of decay, whether they arise from the action of the seeds of cryptogamous plants, vegetating in the wood, or from the presence of the albuminous parts of the tree. Mr. Kyan thought the evil might be stopped; that the commencement even might be prevented by the application of corrosive sublimate, in consequence of the chemical combination which takes place between the corrosive sublimate and those albuminous particles, which Berzelius and others of the highest authority, consider to exist in and form the essence of wood; which being the first parts that run to decay, cause others to decay with them. Mr. Kyan's conviction was such that he went to the Admiralty to place it before them. They required certain trials to prove the soundness of the application, which trials he (Prof. F.) would now have to bring forward. After these were carried on for two or three years, the Admiralty advised Mr. Kyan to take out a patent; and were still engaged in watching the progress of these trials since that period.

He would now tell them how it was proposed to prepare timber, and what were the results. The proposition was to soak the timber itself in a solution of corrosive sublimate. Prof. F. then showed the model of what is termed a tank, in which the timber is to be immersed in the solution. He said that the meeting must not be struck with

the name of that which a few years ago was rather expensive, but now a cheap application, for a pound of it did not cost *much in proportion to the good that would ensue, which he* (Prof. Faraday) *thought would be fully confirmed by the result after a few years' experience.* This being done, the timber is dried, and said to be prepared; it has been applied by Sir Robert Smirke to the new buildings in the Temple, and has been tested in a very extraordinary way, of which some account will now be given.

Besides the application of corrosive sublimate to timber, it has been applied to various fabrics not composed of wood, as, for instance, canvass, cottons, tows, and hemp, to prevent their decay. Before him were some of the pieces submitted to trial by order of the Admiralty, three years ago, in the fungus pit at Woolwich, which he (Prof. Faraday) went the other day to see opened. It was a pit dug in the yard, and enclosed by wood on all sides, having a double wooden cover; it was damp of itself, and into this were put various kinds of wood of which they wished to make trial. One specimen was a piece of timber which came out at the end of three years as sound as it went in; but the unprepared timber had decayed up to the very joint. No part of it had been left, it had decayed and become rotten throughout, but the piece before them was left whole and sound, and fit for the construction of vessels. Last week he saw a large cube of wood which had been there first for three years; it was taken out, examined, and put in for two years more, altogether making five years. That cube of wood was again taken out and examined by him on Tuesday, the 19th of February; it was hard and sound. *There was no sign of decay in that wood which had been submitted to the rotting action for five years,* nor of that destruction which seems to have come on so soon in the same pit with other pieces of wood.

Sir Robert Smirke had had a couple of posts put up under a dropping eave, and both were exposed to the same actions. After a certain time one of them decayed; the other still stands, having been preserved by the power of this substance. There were before him some specimens of convass and cotton which had been in various ways exposed to damp, placed in a cellar on the 10th of December, 1832, and left till the 21st February, 1833: they were taken out for the purpose of being exhibited that evening. Another, a prepared and unprepared piece, which had been coiled up in a cellar from the 15th December, and left to the 21st February, 1833. The opposite effects seen were produced by the same circumstances of exposure on prepared and unprepared calico. One was as it went in, but the other was the calico corresponding to it, which had rotted and decayed. It was not possible to unfold it without destroying it, yet it had been similarly exposed as the first. Nothing could here deceive regarding the appearance of mildew; the difference between the two was so evident, that no person could make a mistake about them: one had run into decay, and was falling to pieces. Now he (Prof. Faraday) must confess, for his own part, that he was perfectly satisfied of the preservative effects of corrosive sublimate. He knew beforehand that it would preserve things far more liable to decay than timber,

canvass, and cotton, but had had doubts as to its application. His query, in the first place, had been—was this preventive, or anti-corruptive, substance, of such a nature that it could remain there, or was the effect not merely a temporary one, that would pass away after a time; and in the timber of vessels which were exposed to the bilge-water, and other water, where vessels were not coppered, was the sublimate not likely to be removed, and its effects destroyed? and, if that were not the case, was there not a fatal injury that might arise from the production of a noxious atmosphere? The answer was "No, we expect not; for chemical combination has taken place between the corrosive sublimate and the body to be preserved; and it prevents the destructive power going on, by combining and forming a new chemical compound with the albuminous matter of the wood." This being to him at that time a doubtful opinion, he wished to obtain some proofs for his own satisfaction. And it was certainly true that the juices and sap of a plant were of such a nature that they would precipitate corrosive sublimate. He had before him, by way of illustration, a solution of corrosive sublimate, which would prove that the juices, or rather substances, remaining from the juices in the fibres of the plant, were easy of combination; that if a stem or branch of a tree were cut, the branch allowed to bleed, and the sap made to flow into a solution of the corrosive sublimate, combination did take place. Some of the solutions used for the purpose were now exhibited; also, various infusions of juices from plants. He took one of these, and poured it into solution of corrosive sublimate; a combination was *instantly* effected, like the combination of vegetable substances with mineral bodies, producing similar effects, and altering the nature of the substance from that derived from the original source. It was also the nature of corrosive sublimate itself, that it entered, in this case, into a new combination, and that new properties were superinduced on the old ones. Therefore it was not to be expected, when they thus come together by a kind of chemical union, that the properties of the original substance should be free to act. No; part of the properties of the corrosive sublimate were subdued, and, in fact, the substance was not in that state in which it could be volatilized, or removed at ordinary temperatures. Very simple proofs would be satisfactory. It occurred to him to take some of the prepared canvass, washing it thoroughly in water several times, to see if the sublimate could be removed from the cloth. Calico was taken in preference, because it seemed more easily to allow the removal of the new chemical combination, if that could be effected. He thought it would be the most conclusive proof to be obtained; for, if the properties of the compound would resist the application of water in calico, they would of course do so in timber, where the substance, combining with the sublimate, was contained in the pores of the sap vessels. Not being satisfied with the work of others, he washed the prepared calico himself in water: he then showed a board on which he had put this washed calico; on one part was shown the portion of prepared calico which had been washed, and on the other a similar piece unprepared. The latter was covered with a coat of fungus nearly half an inch

thick; the former was quite free from it. To be certain whether the calico so prepared and washed did retain any mercury, and to assure himself that it had not been accidentally so placed in the damp cellar that it was left uncorroded, while the unprepared piece was corroded, a portion was treated with dilute nitric acid, by which means he could, though to the injury of the whole material, separate the mercury. By washing the prepared calico in water, he was unable to obtain any portion of the metal, but the mercury *was* separated by nitric acid, showing that it had been in combination; and there was no reason, after such trials, to suppose it could be washed away, or rise as vapour, and be injurious. These two or three experiments influenced him in giving his judgment, that the process would be found effectual in preserving timber. He added, *I think the improvement so great as fully to justify its extensive application.*

A variety of official documents for His Majesty's Government, in proof of the efficacy of this process, have also been forwarded to us, which are perfectly satisfactory as to the practicability and success of the preparation.

Documents have also been received from high medical authority, that the process is in no way noxious, or deleterious to the health of the parties employed therein, or in the after use of the timber.

[*Lond. Jour.*

On the use of steam expansively, in a letter from Mr. John Farey *to the Editor of the Repertory of Patent Inventions. Dated London, February* 24, 1833.

Sir,—In your last number, at p. 103,* it is stated, that the merit of the discovery of the method of working steam engines by the expansive action of steam continuing the motion of the piston, after the communication from the boiler to the cylinder is cut off, is due to Hornblower, who, in 1781, obtained a patent for the invention that he used two cylinders; and Mr. Watt, in the following year, obtained a patent for expanding steam in one cylinder.

As this is a mis-statement which tends to take from Mr. Watt the merit of one of his most valuable discoveries, and transfer that merit to another, it concerns the reputation of your Repertory to have it corrected. The facts are all upon record, and are as follows—

Mr. Watt had fully conceived the expansion principle at a very early period of his brilliant career, about the time of his first patent in 1769; a letter written by him from Glasgow, to his friend Dr. Small, at Birmingham, dated 28th May, 1769, contains the following passage—"I mentioned to you a method of still doubling the effect of the steam, and that tolerably easy, by using the power of steam rushing into a vacuum, at present lost. This would do little more than double the effect; but it would too much enlarge the vessels to use it all. It is peculiarly applicable to wheel engines; and may sup-

* This Journal, p. 277.

ply the want of a condensor, where force of steam only is used; for open one of the steam valves, and admit steam until one-fourth of the distance between it and the next valve is filled with steam; shut the valve, and the steam will continue to expand, and to press round the wheel with a diminishing power, ending in one-fourth of its first exertion. The sum of the series you will find greater than one-half, though only one-fourth steam was used. The power will indeed be unequal, but this can be remedied by a fly, or in several other ways."

This passage shows a full knowledge of the principle of expansive action, and Mr. Watt applied it to practice in an engine at the Soho Works, in 1776, and in the engine at Shadwell Water Works, London, in 1778, just in the same manner as has ever since been followed. Mr. Hornblower's invention, for which he had a patent in 1781, was the use of two cylinders, which was his means of carrying Mr. Watt's previous invention of expansive action into effect; and there is no statement whatever in Mr. Hornblower's specification, announcing the principle of expansive action as his invention or discovery.*

Mr. Watt's subsequent patent of 1782, was for various contrivances to cause the unequal powers wherewith the steam presses upon the piston, during the act of expanding, to produce uniform effects in working the pumps. None of those contrivances have come into use any more than Mr. Hornblower's two cylinders; but the original plan adopted by Mr. Watt, in the engine at Soho, in 1766, has been followed to the present day, without alteration, in the engines made by Messrs. Boulton and Watt.

Mr. Hornblower's claims as an inventor, became a subject of public inquiry in 1792, when he applied to parliament for an extension of the term of his patent of 1781, and was opposed by Messrs. Boulton and Watt. The advantages of his method of using two cylinders, over Mr. Watt's method of using one cylinder, was strongly urged; but no claim was set up by Mr. Hornblower, to the merit of having discovered the principle of working by expansive action; and, I believe your last number is the first printed statement to that effect.

Another statement requiring correction in your last number, pp. 100, 109, 110, is, that the best engines by Boulton and Watt, are estimated as capable of raising 19,800,000 lbs. per bushel of coals, which number is adopted for a term for comparison with an extraordinary performance of the best modern engine.

The fact is that 19.8 millions is the average performance of about twenty-seven engines in Cornwall, taken during the whole of the years 1813 and 1814, when Mr. Watt's system was universally followed;

* The passage occupying the last four lines of your p. 103, and the first three lines of the following page, although beginning with, "He states that," and marked with inverted commas, is not to be found in Mr. Hornblower's specification, (which is printed in the first series of your Repertory, vol. iv. p. 362,) nor any words to the same effect. This mode of misquoting from your own work, calls for your examination in your editorial capacity, particularly when the tendency is to attribute the inventions of one man to another. After you have examined the roll, you can inform your readers whether it is a fair quotation of any thing stated by Mr. Hornblower.

and a corresponding two years average of the performance of the engine at Wheal Towan, viz. 1828 and 1829, is 76.76 millions, which is far below the very extraordinary performance of 125,749,330. The statement of eight cubic feet of water being converted into steam by a bushel of coals, pp. 102 and 110, is liable to the same objection, that being the very lowest performance of badly managed engines: good boilers of Mr. Watt's construction, will evaporate ten cubic feet for an average performance.

If you think the subject of the performance of the steam engines in Cornwall interesting to your readers, you may, perhaps, choose to give them a reprint of a paper, of which I enclose a copy, and which I drew up with great attention to accuracy, at the former time when the law of patents was a subject of inquiry by the legislature, and I had occasion to cite Mr. Woolf as a notable instance amongst inventors left unrewarded by patents.

Remarks by the Editor of the Repertory.

We have great pleasure in giving insertion to Mr. Farey's letter, being at all times most anxious to correct any errors which may accidentally get into our pages.

It would appear that the inverted commas are inserted in the wrong place, the last sentence only of the paragraph of Mr. Galloway's paper, referred to by Mr. Farey, will be found to be verbatim from Hornblower's specification. The words of the specification are, "*I employ the steam after it has acted in the first vessel, to operate a second time in the other, by permitting it to expand itself, which I do by connecting the vessels together, and forming proper channels and apertures.*"*

We have also given Mr. Farey's paper, relative to Mr. Woolf, by which, and the paper of Mr. Galloway in our last, our readers will now be in possession of the most valuable information on the subject of using steam expansively; yet we should be wanting in our duty if we were not to take this opportunity of remarking that, having again read Woolf's specification (which from beginning to end is one series of errors,) and after some years' knowledge of the subject, and even after having read the present paper of Mr. Farey, we have not been able to find out what was Woolf's invention or discovery; nor have we ever been able to ascertain why his friends should have considered him deserving reward from his country as an unrewarded patentee, when there was not one tittle of truth, or invention, in the whole of his specification. All the merit he can possibly be entitled to is for his perseverance in getting expansive steam more generally used in Cornwall; but this was not effected till he had abandoned every principle laid down in his specification;† and there are many others in Cornwall equally deserving credit for perseverance. If there be any points which have not come to our knowledge in respect of Woolf's

* Vol. iv. p. 362, Repertory of Arts.

† Vol. vi. p. 84, second series, Repertory of Arts.

claim, no one can set us right better than Mr. Farey, and we shall be happy to publish any thing which may be the means of producing a just reward.—ED.

(*To be continued.*)

¶ POPULAR SCIENCE.

No. V.

On the Instincts of Birds. By JOHN BLACKWALL, *Esq. F.L.S.*

The manners and economy of the inferior orders of animals, form one of the most interesting subjects of investigation which can engage the attention of the philosophic naturalist. An acquaintance with this important but greatly neglected branch of zoology, conduces to the correction of numerous erroneous opinions, and groundless prejudices, and opens an inexhaustible source of valuable information and rational amusement. It throws also much light on the operations of that mysterious agency which regulates those actions of animated beings, that, although attended with consciousness, do not result from observation, instruction, experience, or reflection, and have, therefore, generally been termed *instinctive actions.*

When we consider how many creatures are objects of superstitious dread or veneration, and what multitudes, even in this enlightened age and country, are sacrificed annually to mistaken notions of their mischievous properties, reason and humanity are alike shocked; and we deeply deplore the prevalence of errors, which the zealous promulgation of more correct ideas and liberal sentiments can alone effectually remedy. That useful bird, the white owl, which, on account of the great number of mice it destroys, ought to be carefully protected by the farmer, is frequently looked upon with terror as a forerunner of death, which it is supposed to announce by its loud and dissonant screams; and a small coleopterous insect, the *Anobium tessellatum* of entomologists, has obtained the appellation of Deathwatch, from a fancied connexion between the ticking sound it produces, and that awful event. The raven and magpie are imagined, by persons of weak intellect and timid dispositions, to prognosticate evil; and this notion has been extended and perpetuated by the allusions made to it in numerous legendary tales, and in the writings of our poets. To take the life of a swallow or martin, or to disturb their nests, is regarded as an unlucky event, portending disaster to the unfeeling aggressor; and the red-breast and wren owe much of their security to popular prepossessions, equally without any rational foundation. Many birds which subsist almost entirely on insects, as the cuckoo, redstart, and flycatcher, are shot by ignorant gardeners and nurserymen, indiscriminately with those species which feed principally on the seeds of plants, and other vegetable productions. The goatsucker and the hedgehog are falsely accused of sucking the teats of animals, and a price, usually paid out of the parish rates, is still given

for the latter in many parts of England;* and those beautiful and harmless reptiles, the common snake and blindworm, are destroyed without pity, upon the groundless supposition that they are venomous.

These are a few instances only, selected from many that have fallen under my own observation, of the pernicious consequences which result from an ignorance of that useful portion of natural history which at present engages our consideration.

We will now proceed to notice, briefly, some of the numerous advantages to be derived from a successful cultivation of this delightful study; and a correction of the above-mentioned errors and abuses, with the needless waste of life which it would prevent, is not among the least of them. For the preservation of our persons and property, from those creatures by which they are liable to be injured: for the best methods of promoting the increase, improving the condition, and effecting the subjection of such as contribute to our benefit or amusement; and for the skilful management of our valuable reclaimed and domestic animals, which supply us with so many comforts and luxuries, we must depend, in a great measure, upon our knowledge of their habits, manners, and propensities. To this knowledge, also, the practical physiologist is indebted for a means of enlarging his acquaintance with the phenomena of life; the scientific naturalist, and particularly the ornithologist, for an excellent mode of distinguishing species, under circumstances in which the ordinary rules for determining them are of little or no avail; and the physico-theologist, for a more comprehensive view of the power, wisdom, and goodness, of the Creator, as manifested in his living works.

Having thus succinctly adverted to the great importance of accurate information in this extensive department of zoology, I shall now limit my remarks exclusively to the feathered tribes; and whoever attentively considers the diversified operations of the various active powers, with which the interesting beings that compose this pleasing division of the animal kingdom are endowed, cannot fail to receive a high degree of mental gratification.

It frequently happens, that the experienced observer is enabled to discriminate birds with the utmost certainty, by their notes, manner of flight, or some other peculiarity, when he has no opportunity of procuring specimens of them, or of ascertaining the colours of their plumage. Indeed, in this last particular, distinct species, as the willow wrens, several of the larks, finches, &c. so nearly resemble each other; and individuals of the same species, as many of the falcons, gulls, sandpipers, ducks, &c., are so very dissimilar, and vary so greatly with age, change of season, and other circumstances, that colour cannot always be relied upon as affording sufficient evidence

*Sixpence a-head, I am well informed, has been recently obtained for hedgehogs in this parish. Now, it is truly disgraceful that any portion of the public money should be expended to encourage the destruction of an inoffensive animal, which derives its support from insects and vegetables, because, in the opinion of the vulgar, it is injurious to cattle.

of specific identity. A much surer criterion will be found in the uniformity so conspicuous in the manners and economy of birds of the same kind; a coincidence which can only be accounted for by supposing that their actions are instinctive. That this is actually the case I shall attempt to show, though it must be admitted that they are occasionally modified, in a considerable degree, by the exercise of the intellectual faculties.

I will not occupy the time of the Society in examining the many vague and contradictory opinions, which have been entertained with regard to the nature of instinct, by the various authors who have written on the subject, being convinced that they are purely speculative, and tend to retard, rather than advance, the progress of science. We must not, however, pass unnoticed, the sophistical doctrine, so ingeniously maintained by Dr. Darwin, in Zoonomia,* that what is usually termed instinct in animals, has reference to the powers of intellect solely; since the feathered tribe, notwithstanding the highly curious and unequivocal examples of instinctive actions which they exhibit, have furnished him with some of his most plausible arguments in support of it.

Depending on the assertion of Kircher,† that young nightingales, when hatched by other birds, never sing till they are instructed; and confiding in the remarks of Johnston,‡ that the nightingales which visit Scotland have not the same harmony as those of Italy; Dr. Darwin was hastily led to conclude, that the songs of birds, in general, are artificial. Having observed, also, that poultry readily obey their usual summons to be fed, and that young ducks, hatched under the domestic hen, soon appear to understand her calls; and giving credit to the mistaken idea, that wagtails and hedge-warblers feed the young cuckoos they bring up, long after they leave the nest, whenever they hear their cuckooing, which, on the authority of Linnæus,§ he states to be their cry of hunger, he was induced to adopt the same opinion respecting their calls. Now, whether the song of the nightingale results from education, as Kircher maintains, or whether it is wholly independent of tuition, I have never had any direct means of deciding, as the bird is only an accidental visiter in this part of the kingdom. From unexceptionable experiments, however, made with the greatest care, on several other species of British singing birds, I have no hesitation in affirming, that the peculiar song of each is the natural consequence of an instinctive impulse, combined with a suitable state of the vocal organs. This latter condition deserves particular attention, for it is a fact, which has been very generally overlooked, that most of our songsters are absolutely unable to continue their melodious strains beyond the latter end of July, or the beginning of August; the strenuous but unavailing exertions they make to prolong them, sufficiently proving their silence not to be a matter of choice, but of necessity. This circumstance, together with the extreme difficulty

* See the section on Instinct, vol. i.
‡ Pennant's British Zoology.
† De Musurgia, cap. de Lusciniis.
§ Systema Naturæ.

they experience in recommencing their songs in spring, clearly demonstrates, that their delightful warblings depend upon the energy of those muscles which contribute to form the voice; an energy which appears to be influenced chiefly by food, temperature, and the exercise of the reproductive functions; for, by due attention to the regulation of these particulars, the vocal powers of caged birds may be called into action, or circumscribed at pleasure. Of this, persons who have the management of breading canaries may easily satisfy themselves; and female birds, in a state of captivity, when brought into high condition, are known, occasionally to assume the song of the male. That Johnston must have been deceived in supposing he heard the nightingale in Scotland, is evident, as it is well known that this warbler is never found north of the Tweed, in Great Britain. It has been ascertained, too, contrary to the opinion of Linnæus, that young cuckoos, before they come to maturity, utter a feeble cry only; they cannot, therefore, acquire the calls of their species while they remain in this country. No wonder, then, that the conclusion Dr. Darwin arrived at was erroneous, when the premises on which his reasoning is grounded are so inaccurate.

It is not, let me remark, intended to insinuate, that birds are incapable of attaining any knowledge of each other's notes, since our domestic fowls, in many instances, are certainly enabled, by observation and experience, to connect vocal sounds with the ideas they are intended to convey.* The martin, also, readily learns to distinguish the swallow's call of alarm; and the ringed plover, sanderling, and dunlin, when associated together, evince, by the promptitude and exactness with which they perform their various aerial evolutions, that they comprehend one general signal. All that is meant to be insisted upon is, that the notes peculiar to every species, in a state of nature, are instinctive. This I have endeavoured to prove, in an essay read before the Society in 1822, and printed in the fourth volume of the new series of Memoirs, by showing, that even such individuals as are brought up in situations where they have no opportunity of being instructed in their appropriate notes, do, nevertheless, utter them naturally.

Dr. Darwin conjectures that birds learn how to build their nests from observing those in which they are educated, and from their knowledge of such things as are most agreeable to their touch in respect to warmth, cleanliness, and stability; but the undeniable fact that birds, when taken very young, even before they can see, and brought up in confinement, do sometimes construct nests, is alone sufficient to refute this opinion.

The sparrow hawk and kestril often make use of the deserted habitation of the magpie as a receptacle for their eggs, and the sparrow frequently takes forcible possession of the rustic dwelling of the house-

* When our domestic cock gives notice to his mates that he has discovered some choice morsel of food, the turkey-hens always hasten to secure the delicacy, which the gallant chanticleer suffers them to take, even out of his beak, without the least molestation.

martin for the same purpose. Why, then, are they never known to build nests similar to those which they thus appropriate to themselves? and why does not the cuckoo, which is always brought up in the nest of some other bird, construct one itself?* The reason is obvious, the act of nidification is not regulated by observation or instruction, but is under the immediate direction of instinct.

Guided by this mysterious power, individuals of the same species, under the like circumstances, always adhere to the same style of architecture. Thus, some of the smaller birds, which produce a large number of eggs, constantly make the entrance to their nests very narrow, and line the interior with an abundance of such materials as conduct heat slowly; while the ringdove, which lays two eggs only, forms so slight a structure, that they may be frequently seen through it. The partridge, land-rail, and those birds whose young are able to run almost as soon as they are hatched, generally give themselves very little trouble in providing nests for their progeny; and some species of water fowl do not make any, but deposit their eggs in the crevices, and on the projecting shelves and ledges of lofty rocks, or upon the bare ground. The sociable grosbeak builds in society under a common roof. The Pensile, Abysinian, and Phillippine grosbeaks construct curious nests, which they suspend from the slender twigs of trees, particularly such as grow over water; by this means, securing their offspring from the predatory attacks of their numerous enemies; and the tailor-bird frames its temporary abode by sewing two leaves together with the flexible fibres of the plants, and lining the cavity with the lightest and softest animal or vegetable down.

It is true, that in preparing their nests, birds occasionally accommodate themselves to some circumstances, and take advantage of others, in a manner which seems to indicate a large share of intelligence. The wren, for example, usually adapts the exterior of its compact fabric to the situation in which it is placed. When built against a hay stack, hay is almost invariably made use of, and green mosses, or withered leaves, and ferns, are employed, as green or the various shades of brown, prevail in this vicinity. Nor, let it be imagined that these substances, which, from their contiguity, are often most easily procured, are selected as a matter of convenience merely; for I have known this minute bird bring long pieces of straw from a considerable distance with much toil, and, with incredible perseverance, mould the stubborn material to its purpose, solely because its colour approached that of a garden wall, a hole in which, occasioned by the giving way of a loose brick, it had chosen to place its nest in.

A lady who keeps canaries was obliged to separate a young brood from their parents, having observed that the male bird stripped off

* I have pointed out the errors into which Dr. Darwin has fallen in his remarks on the cuckoo, in my observations on that bird, printed in the fourth volume of the new series of the Society's Memoirs.

the soft feathers from their necks and wings, for the purpose of lining a newly constructed nest with them, notwithstanding a supply of old feathers had been put into the cage. From this remarkable fact, for which I am indebted to Dr. W. Henry, it is evident, that canaries do not collect materials for their nests indiscriminately, but that they make a selection, in which they are directed by powers of a higher order than those of a merely instinctive character.

Mr. White, in his Natural History of Selborne, p. 59, informs us, that in Sussex, where there are very few towers and steeples, the jackdaw builds annually under ground, in deserted rabbit furrows. The same author remarks also, p. 175–6, that many sand-martins nestle and breed in the scaffold holes of the back wall of William of Wykeman's stables, which stand in a very sequestered enclosure, facing a large and beautiful lake near the town of Bishops Waltham in Hampshire; and some birds, as already represented, frequently spare their own labour, by taking possession of the nests of others.

In these instances there certainly appears to be a great display of sagacity; yet there are facts which seem to render it doubtful, whether the feathered tribes are capable of deriving much benefit from experience, or of exercising any remarkable degree of intelligence. Thus, birds when engaged in the performance of their parental duties expose themselves without hesitation to dangers which at another period they would carefully avoid. Many species, also, while under the incitement of appetite, are readily snared by the most simple contrivances, directly after witnessing the capture of their companions; and rooks continue to breed in those rookeries, where the greater part of their young is destroyed every spring.* For three successive seasons a pair of redstarts persisted in making their nests in the upper part of our pump, on that end of the lever which is connected with the rod of the piston, and, of course, always had it disturbed when that engine was used. Mr. White observes,† too, that in the neighbourhood of Selborne, martins build year by year in the corners of the windows of a house without eaves, situated in an exposed district; and as the corners of these windows are too shallow to protect the nests from injury, they are washed down every hard rain; yet the birds drudge on to no purpose from summer to summer, without changing their aspect or house.

These actions, it cannot be denied, seem to indicate a more limited degree of sagacity in birds, than might be inferred from those immediately preceding them. This apparent contradiction, however, may be easily reconciled, by admitting, what in all probability will be thought sufficiently obvious, that the dictates of the understanding are frequently too feeble to resist the powerful influence of instinctive impulse. Several examples, illustrative of this view of the subject will be found interspersed through the remainder of the essay.

* I am assured by T. Leigh, Esq., that many thousands of young rooks are shot every breeding season in his extensive rookery at Lyme Park, in Cheshire.

† Natural History of Selborne, p. 160.

There is not any necessity, therefore, for entering into a more detailed consideration of it here.

[TO BE CONTINUED.]

Meteorological Observations for September, 1833.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Dew point	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches				Inches.	
	1	65°	85°	29.75	29.75	58°	SW. N.	Brisk.		Clear day.
	2	56	69	.95	.95	57	W.	Moderate.		Flying clouds—clear.
	3	56	64	30.00	30.00	55	E.	Calm.		Cloudy day.
	4	65	80	29.80	29.80	69	S.	Moderate.		Cloudy—flying clouds.
	5	65	84	.90	.90	63	W.			Light clouds—do—Aurora bo
	6	64	79	30.00	30.00	57	W.			Cloudy—light clouds. [realis.
☽	7	56	69	.00	.00	60	W. SW.		1.80	Cloudy—drizzle—rain in the
	8	60	61	29.80	29.85	59	E.	Blustering	0.09	Drizzle. [night.
	9	55	70	30.00	30.00	53	SE.	Moderate.		Cloudy—flying clouds.
	10	56	72	29.85	29.72	65	W.	Blustering	0.10	Cloudy—thunder shower.
	11	54	69	.83	.96	43	W.	Brisk.		Clear day.
	12	54	63	30.00	30.10	53	NW.		0.30	Cloudy—rain.
	13	45	61	.15	.15	40	W.			Clear day.
	14	43	62	.10	.10	43	W.			Clear day.
	15	44	69	29.90	29.90	48	W.	Moderate.		Clear day.
⊗	16	51	69	.95	30.00	50	W.			Clear day.
	17	56	70	30.05	.10	52	W. SW.			Clear day.
	18	59	64	29.90	29.95	62	SW.		0.70	Rain.
	19	64	77	.90	.90	72	W.			Fog—clear.
	20	64	64	.86	.80	71	N.		0.25	Clear—rain—thunder—high
	21	68	63	.80	.80	69	NW.		0.02	Cloudy—drizzle. [wind.
	22	56	64	30.00	30.00	46	W.	Brisk.		Flying clouds—clear.
☾	23	49	64	.00	.00	46	W.			Clear day.
	24	49	65	29.90	29.90	46	W.			Clear day.
	25	50	70	.90	.90	45	W.			Clear day.
	26	52	72	.85	.80	55	W.			Clear day.
	27	55	78	.70	.75	57	W.			Clear day.
	28	58	75	.90	.93	58	NE.			Cloudy—clear—shower in the
	29	64	80	.90	.90	63	S.		0.04	Clear day. [night
☉	30	64	73	30.00	30.05	51	W.			
	Mean	56.37	68.83	29.92	29.93	54.8			3.30	

Thermometer.			Barometer.
Maximum height during the month,		85. on 1st,	30.15 on 13th.
Minimum	do.	29. on 2nd.	29.70 on 27th.
Mean	do.	63.60	29.92